TRANSACTIONS

OF THE

TWENTY-FOURTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

HELD AT
CLEVELAND, O.
OCTOBER 16, 17, 18, 1919

NOTICE!

At the 1919 meeting of the Academy, the Editor was instructed to make an index of the Transactions, including the 1920 meeting. Unfortunately, he has not access to a complete set of the Transactions, and would greatly appreciate the loan of certain volumes, especially the earlier ones of the Academy, and those of the Western Ophthalmological and Oto-Laryngological Society. Will any member who can assist him in this way kindly let him know as soon as possible what volumes are available?

The Editor has received numerous orders for complete sets and individual volumes of the Transactions, which the Academy has not in its possession. If any member desires to dispose of his set, complete or incomplete, and will notify the Editor, he will put him into communication with such inquirers.

CLARENCE LOEB, M. D., Editor,
25 E. Washington Street, Chicago, Ill.

The Twenty-fifth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology will be held at Kansas City, Mo., Oct. 14, 15, and 16, 1920.

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RAY, J. M., Louisville, Ky. 1914
BECK, JOSEPH C., Chicago, Ill. 1915
BROWN, JOHN E., Columbus, Ohio. 1916
DAYTON, W. L., Lincoln, Neb. 1917
GREENWOOD, ALLEN, Boston, Mass. 1918
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FRANCIS, LEE MASTEN, Buffalo, N. Y. 1920

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TRANSACTIONS

OF THE

TWENTY-FOURTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

JOINT SESSIONS

THE ROLE OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY IN THE RECENT WORLD WAR.

ALLEN GREENWOOD, M. D.,
BOSTON, MASS.

It must be apparent to you all that the task of giving in detail the part played by the members of this Academy in the World War is a task impossible of complete accomplishment. All that any one individual or group of individuals could do would be to give in a general way some account of the more conspicuous part played by the members of both sections of this Academy.

Let me, first of all, make the broad statement that every individual active member of this Society has in some way or another done his bit in the recent struggle. Many of the members, for various reasons, were unable to enter the active service of the Medical Reserve Corps and it was, of course, well that this should be so, thus allowing for the carrying on of civilian work in this country and the various hospital clinics. The men who stayed in civilian life also had the task of helping carry on the practice of men who had entered the Medical Corps. Many men also served on Advisory Boards, probably all bought Liberty Bonds and in this way every member, as said before, in some way did his bit to the best of his ability. There being no possible way of ascertaining accurately what each member has done along the lines suggested above, the author must, perforce, confine himself to a brief resumé of the medical services performed in as far as he has been personally cognizant of them, or from data furnished from the offices of the Surgeon Generals of the Army and Navy. A Canadian member of the Academy was enrolled in the British service and for a long period was C. O. of the McGill University hospital, stationed near Bologne. He has given over 4 years to the service of his country and no member deserves higher praise.

In the very early days of the war, long before there seemed any likelihood of our country participating in the conflict, a number of the members of both sections were enrolled either with the French or British services. In the early part of 1915 several joined the Harvard Surgical Unit, which served throughout the war in British Expeditionary Force Base Hospital No. 22, in northern France. These men remained only a short time, however, but their experiences proved of value to them and to their

country when, later on, they occupied positions of importance in this country and abroad. One of the members of this first Harvard Surgical Unit became a member of the Sub-Committee on Oto-Laryngology in the Council of Defense and later the efficient director of the Oto-Laryngologic service in the office of the Surgeon General of the Army. Another of our leading members, who arrived in France with one of our first Red Cross Hospitals, did such notable work in those trying days that he naturally stepped from his position in a local hospital to act as organizer and director of the Oto-Laryngologic service for the American Expeditionary Forces, being rapidly advanced in rank. His service throughout the long period during which he was separated from his home ties was extremely efficient and his organization served as a model for others. The members of this Academy may consider themselves peculiarly fortunate that they had two such progressive members at the head of the Oto-Laryngologic service in Washington and in France.

Some of our members were also, shortly after our entrance into the war, assigned to Red Cross Hospitals, which went to serve with the British and there obtained experience which later made them valuable for some important positions with the American Expeditionary Forces. One such member was largely concerned with the building up of the ophthalmic service in the American Expeditionary Force and particularly helpful in providing for the control of trachoma.

Very shortly after this country was forced into the conflict a Sub-Committee of the Medical Board of the Council of National Defense was organized to assist in the enrollment of men specially trained in ophthalmology and a little later a similar Sub-Committee was formed to serve a like purpose with regard to Oto-Laryngologists. This early formation of the Sub-Committee of Ophthalmology grew out of the foresight of one of our most prominent members, who became the Chairman of the Sub-Committee and to whose ability to visualize coming events this Academy owes perhaps more than to any other member. Later he took charge of the Ophthalmologic Reconstruction work for the Surgeon General and we are indebted to him for the establishing of the Red Cross institution for the blind at Baltimore which, under his care as Director, became a model of its kind. During the late spring and summer of 1917 the members of the Sub-Committee of Ophthalmology spent the major share of their time in Washington planning for an efficient ophthalmologic service. These men, representative ophthalmologists of the United States,

for nearly six months, gave freely of their time and strength to this service. This was wholly volunteer work and these men were obliged to largely sacrifice their private interests for the good of this service. One of the members of the Committee, with the assistance of two others, occupied part of the time in writing a book on Military Surgery of the Eye, which later was printed as Manual No. 3 of the Surgeon General's office. Another member wrote a compact, up-to-date treatise on Ophthalmology, which was later published as the Manual of Ophthalmology of the Surgeon General's Office. It was through no fault of these authors that these books did not arrive in France until after the war was over. As the summer came to a close the members of the Sub-Committee took up their residence in Washington in order to devote all of their time to their duties on the Sub-Committee. All the ophthalmologists of the country were circularized, many induced to enter the service, records made of their special qualifications and posts assigned them. A revised list of instruments for the army eye case was carefully worked out and instruments selected for the auxiliary case. Arrangements were also made for the construction of special magnets. A good deal of time was occupied in working out plans for a special hospital which later was broadened out to take in all of the specialties included in the Section of Head Surgery. The Philadelphia member of the Sub-Committee of Ophthalmology during this time worked out a list of all materials to be used in a 2,000-bed special hospital and obtained prices on all this material. Besides the plans for the hospital and the listing of supplies the personnel of this hospital was carefully considered. Day after day new letters of acceptance of Commissions in the Medical Reserve Corps were received and the men listed. All of this data concerning this personnel was kept in books, alphabetically arranged by states and these books became known as the Famous Black books of the Sub-Committee on Ophthalmology.

A duplication of this work was carried on by the Sub-Committee on Oto-Laryngology and when the two sub-committees were merged, owing to the fact that many men were carrying on the combined specialties, the work was continued with perfect harmony. The Sub-Committee on Oto-Laryngology standardized instruments, assisted in organizing the Special Hospital and enrolled the Oto-Laryngology of the country. One of the members of the Academy was called in to edit the war manual on Oto-Laryngology. One by one the members of the Sub-Committees on Ophthalmology and Oto-Laryngology entered the service and

were taken in to the organizing work in the office of the Surgeon General.

With one exception all of the members of the joint Sub-Committees of Ophthalmology and Oto-Laryngology were members of this Academy and out of this joint Committee grew the Section of Surgery of the Head, which performed such excellent service in the Surgeon General's Office and which made possible the placing of specialists in all of the Army Hospitals in this country and most of those abroad. One of our members, who was also a member of this Sub-Committee of Ophthalmology, became the Chief of the Division of Surgery of the Head in the Surgeon General's Office and it is doubtful if the wide recognition accorded to specialists would ever have come to full maturity except for his presence in the above-mentioned office. The early recognition of the importance of his position soon caused his promotion to the rank which he so well deserved and he became one of our two Colonels, sharing this honor with the Senior Consultant in Oto-Laryngology for the American Expeditionary Forces, to whom previous reference has been made. Serving under him in the Surgeon General's Office were several of the members of the Sub-Committee, who acted at different times as Chiefs of the Ophthalmic Service. The first man to occupy this position later spent most of his time inspecting the various hospitals connected with the Army cantonments with reference to the utilization of the specialists and the proper construction of the building in the hospitals to be devoted to Surgery of the Head. To him, and to the Chief of the Oto-Laryngologic service in the Surgeon General's Office, we are indebted for the planning of those special buildings. He was followed by one of our members who later was instrumental in organizing the Ophthalmic Service in the A. E. F. and he in turn was followed by one of our prominent associates who, besides his duties in the Surgeon General's Office, made a good many inspection tours and organized the School of Ophthalmology at Fort Oglethorpe. Prior to his occupying this position, he made a tour of the hospitals of France, including some of the British hospitals and his report of that inspection was of great service in the organizing of the department abroad.

Of our members who served on the Sub-Committee of Oto-Laryngology one, who had, as mentioned before, served in the Harvard Surgical Unit in 1915, later became the Chief of the Oto-Laryngologic Section in the Surgeon General's Office, during which period he spent several months on an inspection trip abroad. The two other members of the Sub-Committee of Oto-Laryngology performed noteworthy service, one as substitute Chief of

Oto-Laryngology in the Surgeon General's Office and later as Chief of the Reconstruction Department concerned with the rehabilitation of those with deafness and speech defects, while the other member did splendid work in organizing Red Cross Hospital No. 36 for service abroad, of which, later, he became the capable Commanding Officer.

Too much stress, however, should not be laid on the work done by our more prominent members of the Medical Reserve Corps, for without the hearty support accorded to them at all times by the rank and file of the members of this Academy the pronounced success attending their efforts would have been impossible.

Many of our members acted as regional consultants and many took charge of the various ophthalmologic and oto-laryngologic clinics established in the Base Hospitals in this country, with some even taking charge of a complete surgical service. A few became Commanding Officers of Base Hospitals, in which position, of course, they were not called upon to practice their specialty, except in important cases. Others of our members occupied positions connected with the administration of hospitals and divisions.

A great deal of progressive teaching was carried out in many of the cantonment Base Hospitals by men in charge of the eye and ear services, notably at Camp Sherman, Camp Devens and Camp Dodge. Thus many of our younger members received training and instruction that helped them in carrying on the more strenuous service abroad. The building up of the school at Oglethorpe by members of this Academy was a noteworthy event and cannot but have a lasting effect upon the future education in ophthalmology. Along these same lines a former Secretary of this Society, who had charge of the Ophthalmic Service in Special Hospital No. 115, was instrumental in starting Post-Graduate Ophthalmic teaching in Paris. Our present President had charge of the Oto-Largynology reconstruction work at the Special Head Hospital in this country.

One of our members, who has been in the practice of ophthalmology for nearly forty-five years, gave his time and service to the War Risk Insurance Bureau, with particular reference to visual economics. Another was stationed for a time in Paris in charge of the Department of Urology. Another member at one time received special mention by the British authorities for his services as Sanitary Officer. One of our well-known members who turned his attention to plastic surgery of the face and jaws became the Assistant Consultant in Aural and Plastic Surgery in

the A. E. F. and later did excellent work at the Hospital at Fort McHenry. Many of our members did straight surgical work so that it will be found that practically all branches of medicine and surgery found among our members the men who could turn their talents in almost any direction. The writer, while in the A. E. F., saw many of the younger members of this Academy doing general ward service as well as caring for the ophthalmic cases. This work was done willingly and well and these men deserve the commendations of this Society no less than the men who built up the Ophthalmologic and Oto-Laryngologic services in this country and abroad. The progress of Ophthalmic education and the conservation of vision in our vast armies received a stimulus from the members of this Academy which will have a lasting effect.

The death of one of our most active members came as a blow to everyone. His rapid rise to the position of Commanding Officer of one of the most important Base Hospitals in the middle west was richly deserved, and his place as an ophthalmologic educator will be extremely difficult to fill. Another member also passed away in the midst of his Army service.

It is doubtful if there is any association of specialists whose members, individually and collectively, did more to advance the Army Medical Service.

I have purposely refrained from going into personalities to any extent. You all know of the special accomplishments of our associates, but I cannot close without giving you some idea of what the association of the writer with his confreres has meant in his ophthalmologic career. Can you imagine anything more stimulating than being associated in daily conferences with such of our members as de Schweinitz, Parker, Bordley and Black; to get one's oto-laryngology stimulus from such members as Mosher and Richardson; to have living under one's temporary Washington roof during the winter of 1917 de Schweinitz, Bordley and Black; to go every a. m. (including Sunday) to our labors in the S. G. O. and there plan the practical working out of the work of the Section of Surgery of the Head with Parker, Lyster, Mosher, Richardson, Bordley, Black and the two heads of the other divisions, the genial Blair and the lively Bagley. When Black was acting as Chief of the ophthalmologic division and Blair and Bagley looking out for the Oral and Pastic and Brain Divisions, they were the three busy bees who accomplished the seemingly impossible in the S. G. O. Then when serving abroad what was more stimulating than the association with Derby and Black or more uplifting than the constant association with McKernon, Rae, Blair and Schaeffer.

A BRIEF REPORT OF THE ACTIVITIES OF THE DEPARTMENT OF OTO-LARYNGOLOGY OF THE AMERICAN EXPEDITIONARY FORCES, FRANCE.*

By James F. McKernon, M. D.,
Senior Consultant, Ear, Nose and Throat Surgery,
American Expeditionary Forces.
NEW YORK, N. Y.

Gentlemen:

In presenting to you a brief history of the activities of the Oto-Laryngologic Department of the American Expeditionary Forces, I can perhaps do no better than to give you at first a general outline of what the Department was at the time I was appointed Director and Senior Consultant. At that time it had not arrived at the dignity of the above name, but was known as the Department of Ear, Nose and Throat Surgery, and was merely an offshoot of the department of general surgery.

The first duty of the Chief Consultant was to list all the Base, Camp, Evacuation, Mobile and Field hospitals and divisional areas thus far established, with their personnel and equipment. Second, to obtain a list of the oto-laryngologists already on duty in France and England and to classify them. Such a list was not available in the Chief Surgeon's office. This necessitated visits to all the various hospitals as well as to the divisional training areas. His third duty was to obtain, if possible, a classified list of all the oto-laryngologists in America who were available for overseas duty. For this list and for others that followed, the thanks of the department are due to Colonel Parker, and to Lieutenant-Colonel Mosher of the Surgeon General's office.

The inspection of hospitals showed that when the Senior Consultant was given charge of the Department there were seventeen Base Hospitals actively functioning, with only one oto-laryngologist on duty in each. There were already fifty Camp Hospitals established, thirty of which were not functioning. Only ten of those actively functioning had an oto-laryngologist assigned to them. The total roster of officers doing ear, nose and throat work for the American Expeditionary Forces at this time was thirty-two. Following is a summary of the equipment, or

*Reprinted by courtesy of the American Otological Society.

rather the lack of equipment for this work in the hospitals of the American Expeditionary Forces at that time.

BASE HOSPITALS

One-third of the Base Hospitals operating were lacking in instruments and equipment to care adequately for the patients they were receiving.

CAMP HOSPITALS

Of those functioning, only two had sufficient instruments and equipment to care properly for cases.

EVACUATION HOSPITALS

In only one was an oto-laryngologist on duty, with practically no instruments or equipment with which to work.

MOBILE HOSPITALS

None of these established early had an ear, nose and throat surgeon connected with it.

FIELD HOSPITALS

In none of those functioning was there an oto-laryngologist, or any instruments or equipment for use in this department.

DIVISIONS

There were six oto-laryngologists on duty with various divisions. Later the number was increased as requisitions were made, but at no time during activities were there sufficient officers from this department to meet the demands made upon it.

From the above summary it will be seen that in reality there existed no ear, nose and throat department except the service in the seventeen Base Hospitals, and in those there was no uniformity of standard as to the work performed. This lack of available men on the ground, coupled with the fact that only a small number were occasionally landing in France and England, handicapped very much the early activities of the department. It was found also that while there was an ear, nose and throat man assigned to each of the Base Hospitals, he was supposed to remain there, and for the first six months this ruling held good, even though in many instances two or more men were assigned to the same hospital; and even though some of these hospitals were not actively functioning at the time, their Commanding Officers, with few exceptions, would not allow the officer an assignment for temporary duty elsewhere.

By May, however, we succeeded in obtaining competent men from many of the Base Hospitals, replacing them for the time being with men who were arriving, or with men who had been tried out on front line work and were found more suitable for

Base Hospital work. With these men obtained, and with others who were arriving from time to time, all of our Evacuation and Field Hospitals at that time were manned, and the remainder assigned to divisional work.

Before an oto-laryngologist was assigned to duty with the divisions, it was not unusual to have from 250 to 400 men report sick each morning to the Divisional Surgeon. At least one-half of these cases were suffering from colds and minor complications resulting therefrom. The usual mode of procedure at that time was to send these men to some Base Hospital in the rear, where they were treated for a few days, and then sent to a replacement depot where they were held from three to six weeks and then finally returned to their organization. As soon as an oto-laryngologist was assigned to duty at these divisions, an Infirmary or Dispensary was constructed, and at least 50 per cent of the men presenting themselves for morning sick call with colds and their sequelæ, were treated and returned to duty the same day. Of the remaining 50 per cent about 40 per cent remained in the Infirmary and received treatment for from one to three days, and were then returned to duty with their organizations, thereby saving transportation and loss of man power, of both of which at that time we were sadly in need. The remaining 10 per cent it was found necessary to route to Base Hospitals, where they received the more protracted care and treatment needed.

This system, which was first put into practice by this department, was later adopted in the divisions, the net result being a conservation of man power when most needed as well as a welcome relief to an already over-congested transportation service. While some of the Base Hospitals were well equipped with instruments and supplies, the majority were not, and this was especially true of those that came over during the summer and autumn. Many of these upon landing had no instruments or equipment whatever with which to function, the result being that much valuable time was lost to the service at a period when every hospital and man was sadly needed.

Our Medical Supply Depots at no time carried sufficient instruments and supplies to equip properly a hospital in an emergency, and those instruments they did supply for our department were so few in number and so antiquated that had it not been for the fact that many of the medical officers brought their own instruments, hundreds of cases could not have received treatment at all, for with the exception of buying an instrument here and there that had been discarded by the French during the earlier

period of the war, none could be obtained in France. Later, however, this scarcity of instruments and supplies was not such an acute problem, although the supply was always inadequate to the demand.

HOSPITAL CENTERS

Where several Base Hospitals were established at one place a set of buildings was assigned to this department, so that all the work in the center was segregated. Special wards and operating rooms were arranged, and examination and treatment rooms for ambulatory patients fitted up, and a staff formed composed of officers from the Units of the Center. This obviated duplication of instruments and equipment, and resulted in better care for the patient besides allowing the excess officers in the department to be made available for duty elsewhere.

CENTER CONSULTANTS

In all the large hospital centers a consultant was appointed whose duty it was to have a general supervision over the work of the center and act as Consultant when called upon by the Center Staff or the individual units. This arrangement proved most satisfactory, resulting in a better care for the patient, besides maintaining a more rigid discipline for the Staffs of the Center.

Among the duties of the Senior Consultant was that of visiting all the Base Hospitals as frequently as possible, seeing cases in consultation and operating when necessary and consulting as to the needs of the service with both the Attending Surgeon of the Department and the Commanding Officer of the hospital. During activities visits were constantly made from one Evacuation, Mobile and Field Hospital to another, seeing cases in consultation and advising as to the proper care and routing of the cases, and later following up those cases that had been routed to Base Hospitals in the rear, and consulting as to the nature and amount of reparative work to be done.

CARE AND TREATMENT

Upon a request from the Chief Surgeon, a circular dealing with the care and treatment of cases in this department was prepared and sent to all hospitals in the American Expeditionary Forces, as many cases were being hospitalized unnecessarily for minor operative work. Upon receipt of this circular much of this unnecessary work ceased.

CLASSIFICATION AND STANDARDIZATION

A working schedule for the classification and standardization of ear cases was submitted to the Chief Surgeon, believing

that it would simplify the work in this Department as well as aid the disability Boards in classifying the cases that must come before them.

ROUTING

When possible, all cases requiring immediate special reparative work were routed to hospitals in the advance zone where this type of work could be best cared for and frequent observations made. Those cases that could be transported longer distances were routed to Base Hospital No. 115 where a special staff of officers for reparative work was located.

RECORDS

The ordinary history sheet used in the Army was all that was required, but in many instances this was supplemented by a more complete history from a specialistic standpoint. All officers in the Department were urged to obtain and keep complete records in full and maintain a standard of uniformity. As Consultant I was frequently asked by both regular and reserve officers what need there was for an oto-laryngologist being assigned to an Evacuation, Mobile or Field Hospital. At first my answer was "to care intelligently for cases in his Department." Later experience modified my views on this subject very much. I now believe the need of an oto-laryngologist in an Evacuation, Mobile or Field Hospital is a limited one, owing to the fact that there are but few wounds that would naturally come within the province of the surgeon in this Department that are not multiple, the majority of which concern the general surgeon only. For this reason, especially when there are only a limited number of men available, it is unnecessary to assign a man from this Department for duty at one of these points unless he has had a general surgical training that fits him to act as a member of a team doing general surgery. If a member of such a team can act in a general surgical capacity in addition to caring for those cases that by right belong to this Department, in such a way only can an oto-laryngologist be utilized to a maximum at these points. To assign and maintain one in the front area for this purpose alone would be wasting his time, as his services are more urgently needed in the Base Hospitals of the advanced zone and in large hospital centers where the special cases are collected. At these places the oto-laryngologic surgeon is needed, where his judgment and skill can be utilized in caring for the acute conditions that present themselves, and for the reconstructive work that will follow on these cases that are to be salvaged for future line duty.

The cardinal principle of front line work in our Department was, following the example of the general surgeon, a debridement of the traumatized tissue and removal of all loose bone splinters and foreign bodies, when present. Through and through penetrating wounds were closed primarily. In all cases where wounds were open and there was a tendency to contraction with increased separation of the edges, a primary suture was done in order to obtain a better cosmetic result for the future reconstruction work that was to follow. In penetrating wounds of the outer and superior wall of the antrum no matter how produced, counter drainage was instituted from below. In bullet and shell wounds of the nose where the bones were shattered, debridement followed by the removal of the loose splinters was the rule, but in no instance was there removal of any piece of bone where there was still an attachment of periosteum. These pieces were approximated as accurately as possible and held in place by some mechanical device so as to allow of nature's repair. In this way much bony structure of the nose was preserved, so that the reconstructive work could be made easier and the future result obtained more satisfactory.

All shell and bullet wounds of the auricle were treated by primary suture. Impacted shell fragments in the external auditory canal were removed and the resultant wound treated by the open method in order to promote drainage, and later when necessary, plastic procedures were instituted. In shell and bullet wounds of the mastoid process, removal and open treatment was the rule. In penetrating wounds of the skull in the region of the temporal bone or nasal fossa, a debridement at first was all that was indicated. Later, when the x-ray had localized the foreign body and the patient's condition admitted it, an attempt at removal (which was many times unsuccessful) was made.

In localizing foreign bodies in the brain no instrument gave us as much help by its precision and accuracy as the Hirtz Compass, and later this was used in all foreign body cases to the exclusion of other aids. In no brain case was it permissible to further mutilate the brain tissue by digital exploration. If the foreign body could not be removed by a continuous flow of a warm saline solution or other non-irritating fluid from a syringe, or could not be extracted by aid of forceps it was let alone, as experience soon taught us that many of the cases recovered by letting the foreign bodies remain in situ. When fractures of the skull occurred all depressed areas of the bone were removed. At first a mistake was made by removing too small an area. Expe-

rience taught the error of this, as subsequent hernias were far less liable to occur when a large amount of bone was removed. This is probably due to the fact that a large exposure produces a minimum amount of pressure from within, whereas a small opening makes for a maximum of pressure.

In all wounds of the throat and mouth the principles of general surgery were carried out, always keeping in mind that drainage was an important factor. In reconstruction work of the auricle where the greater portion of it has been destroyed a more satisfactory result was obtained by making casts or moulds, and from these constructing an artificial auricle from what was known as Hemming's Paste, rather than doing a plastic operation. These were easily placed in position and held by spirit cement and made to conform in color to any skin, and could be easily removed and replaced by the patient at any time. Artificial noses were made in the same way. In some of the nasal injuries it was necessary for respiratory as well as cosmetic purposes to loosen all adhesions and elevate them as much as possible by inserting a piece of cartilage or bone to replace in a measure the trauma existing. In many cases it was found advisable to work on these patients in conjunction with dental surgeons, as appliances had to be fitted and incidental details worked out, and much better results were obtained by utilizing the help of one who had been specially trained in devising, making and fitting these appliances. In the reconstruction work that was done, no didactic rules could be laid down as the reparative process depended entirely upon the size, location, shape and condition of the wound and the amount of tissue available for repair. Much less of the reconstructive surgery was done in France than was at first expected. This was owing to the decision made by the Chief Surgeon to return all soldiers to the United States that could not be made ready for line duty in a period of three to four months or less. This decision was in all probability due to our lack of beds at that time.

In many of the cases that confronted us it was quite as important to decide what should not be done as to say what should be done, and in this respect we learned a great deal from both our French and English colleagues, who, by the experience gained in the past four years, were, in a measure, able to say which cases should be operated upon and which should not. Eighty per cent of the work of the oto-laryngologists in France was behind the lines except in the regimental area, and here as well as further back the bulk of it was much the same as that met with in civilian practice, and consisted in caring for the acute conditions and their

sequelæ. During the influenza epidemic the cases where possible were segregated, and all were treated with warm naso-pharyngeal irrigations of saline and sodium bicarb. three times a day, using from a pint to a pint and a half at each sitting. This was followed by inhalations and the air in the wards was kept as moist as possible. This unquestionably proved beneficial, lessening the cough and diminishing the duration of the attack. All mucous membrane irritations due to gas were treated primarily by local applications of lime water or bicarb. of soda. The laryngeal conditions were best controlled by intralaryngeal injections of guaiacol 2%, and camphor and menthol of each 4% in oil.

Considerable criticism was made by some of the men when a circular was distributed through the department relating to tonsils, namely that no tonsils were to be removed except when markedly hypertrophied or diseased, and never during an acute process. This was made necessary by the wholesale removal of tonsils that took place the first few months, and many hundreds of patients were hospitalized unnecessarily until this order was enforced.

EAR PROTECTORS

At first there were many and various kinds. Later on all were discarded and gave way to the use of cotton waste moistened in oil or vaseline. This simple mechanical protection was sufficient as it prevented concussion and maintained a maximum of hearing when worn. It was easy to insert and always obtainable.

Experience has taught us that all hospitals engaged in the care of the sick and wounded should be completely equipped and have the proper assignment of medical officers and nurses when ready to function; and that when assignments are made from the Ear, Nose and Throat Department to Evacuation, Mobile and Field Hospitals those officers should be qualified to act as members of surgical teams, either as heads or assistants, as ordinarily there are not enough cases requiring special attention to occupy their entire time in these hospitals. There should also be a center of instruction established for officers of limited experience, so that they may be taught the modern methods of caring for battle casualties. One of the principle points brought forcibly to our attention was that in wounds involving the anatomic parts that properly come under this department there was a too extensive debridement of the tissues. In some cases this was carried to such an extent that an immediate reparative process was impossible, owing to a lack of tissue with which to repair it, for it should be remembered that in the regions of the ear, nose, throat

and face as extensive a debridement is not necessary as in other portions of the body, because of the anatomic difference in the tissues.

Considerable difficulty was experienced in handling men that were assigned to the Department from divisions and other medical organizations. Many of these men would claim to be expert oto-laryngologists and were assigned to this Department because of this claim or because they were doing regimental line work and wished to make a change, stating that their former training had been entirely along oto-laryngologic lines. These men with few exceptions did not know the first rudiments of ear, nose and throat work, and as soon as this fact was established they were transferred to a Casual Medical Camp, and subsequently utilized in other capacities.

This brings up an important point for the future consideration of oto-laryngologists, namely that of standardization. Is a man qualified to practice this specialty simply because he claims to be a specialist in this line of work? Or should he pursue a course of study in this specialty at some recognized institution where, after a prescribed course, he be examined both didactically and practically, and if successful in such an examination he be granted a specialistic degree? A man taking such a course at an institution chartered with the power to grant such a degree or diploma, would at once in the eyes of the medical world be looked upon as competent to practice his specialty. If such a standardization were established, the self-styled specialist would in the future (as far as medical support is concerned) be a thing of the past. I feel strongly on this point and speak from experience because of some of the material with which this Department was burdened under the guise of specialism.

During mid-summer the calls for consultation work became so frequent that it was impossible to respond to all of them, and the appointment of a Junior Consultant was requested. This request was granted, and Major John B. Rae was appointed and assigned to Headquarters for duty. This appointment was of great help to the Senior Consultant as well as being of the utmost value to the Department, as it made one or other of the Consultants available at all times. During the summer plans were submitted to the Chief Surgeon requesting that one or more schools of instruction be established for officers of limited experience: that this instruction comprise a thorough course on the functional examination of the ear, as well as the routine and operative treatment of nose, throat and ear cases, and that it also include the

teaching of reconstructive work in this department. Owing to the lack of available teachers it was not considered advisable to grant this request, but we were given a promise of establishing these courses later. The early signing of the armistice, however, disposed of any further plans the Chief Surgeon may have had toward establishing such a course of instruction.

In some of the Camp Hospitals only one man was needed to cover the service on the eye, ear, nose and throat. In these instances, through the courtesy of Colonel Greenwood, the Senior Consultant in the Eye Department, an exchange of men between the two departments was made. When the armistice was signed there were 238 officers on duty in the department, and twelve additional held in reserve. When the Third Army was ordered to occupy German territory all the hospitals accompanying them were manned by from one to three officers from this Department, in charge of Major Rae as Consultant, and all instruments and equipment for the special work that was to be carried on was placed with the Medical Supply Depots accompanying the army and requisitioned for use as soon as the hospitals were functioning.

From a personal observation of the French and English hospitals where reconstructive head and face surgery was done, I would most strongly urge that in the event of the United States becoming involved in another war, similar hospitals be established, equipped, surgically manned and ready for work prior to the opening of hostilities, and not wait to see whether or not such hospitals were going to be necessary, as we were told to do in the early days of the war. In my opinion it is just as necessary that such hospitals be ready to functionate at the beginning, as it is that we have Base Hospitals, if we expect to do our duty as surgeons to the wounded. Such hospitals established early give to the patients a better functional as well as cosmetic result, inasmuch as it insures the work being done early by competent men who have previously specialized along these lines.

My warmest thanks and appreciation are due General Ireland as Chief Surgeon, and Colonel Keller as Director of Professional Services, for the help and advice given me at all times. It was their cooperation that made it possible to organize and maintain the Department on an efficient basis. To those officers and their associates who had charge of the services in the Base Hospitals, my own, as well as the thanks of the Department are gratefully given. It was due to their loyal support and willingness to work at all times in any capacity, that made the service efficient for the care of our sick and wounded.

THE WORK OF THE DIVISION OF HEAD SURGERY, UNITED STATES ARMY

WALTER R. PARKER, M. D.
DETROIT, MICHIGAN

The work of the Division of Head Surgery in the Surgeon General's office is familiar to most of you. Some of you know of our successes, and some of our failures. There is one thing Dr. Greenwood touched upon that has been a source of great satisfaction to all who were identified with the work in Washington. The plans as originally outlined at the meetings of the sub-committee of Ophthalmology and Oto-Laryngology, Medical Committee of National Defense, were finally put into effect in every detail. The hospital sent abroad did not functionate as a special hospital up to the time of the signing of the armistice, but had the war continued longer it would have been used as originally planned.

Now that the war is over, it perhaps would be wise to consider how the problem would be handled if we were to do it all over again at this time. What would be our recommendation for the organization in the Surgeon General's office and in the field?

As to the advisability of special organization for Ophthalmology and Oto-Laryngology, I think there could be no question. There remains then to suggest the disposition of the Oral and Plastic, and Neuro Surgeons. I am of the opinion that special organization should exist for the classification of qualified Ophthalmologists, Oto-Laryngologists and Oral plastic Surgeons, but that the neuro surgical work could be best done as a section of the general surgery, rather than as a section of Head Surgery.

In estimating the necessity for specialists in the army during war times, one has to consider the conditions met both in the cantonment base hospital, and in the special hospitals designated for the care of the injured soldiers. In our cantonment base hospitals, previous to the time of the return of the soldiers, there was almost no oral plastic or neural surgical cases, while the material for Ophthalmology and Oto-Laryngology was abundant. On the other hand, in the special hospital designated for the care of the jaw and neuro surgical cases, the work in these departments far exceeded that in Ophthalmology and Oto-Laryn-

gology. In proof of this statement, it is only necessary to recall what would have happened if Oto-Laryngologists were not at hand when there were literally hundreds of cases of mastoid in the various cantonment base hospitals, and to review the work done by oral and plastic surgeons in the hospitals designated for the care of the jaw cases.

When the work first began, the specialists were assigned to the cantonment base hospitals, and were sent to the general hospitals only on request of the commanding officer. The necessity for Ophthalmologists and Oto-Laryngologists in the service is well shown by the fact that the commanding officer of nearly every general hospital in the United States requested the service of an eye, ear, nose and throat man on his staff.

In regard to the classification of the personnel, I believe that the plan as finally worked out at Oglethorpe, somewhat modified, would best meet the requirements. That is, require all medical officers to be sent to Oglethorpe or a similar center for classification and instruction in paper work, and some military training. The relation between time devoted to military duties and to instruction in medicine and surgery has been a subject of much discussion. I am convinced that other than the paper work, only the rudiments in military routine should be required of the older civilian doctors. To find out the qualifications of the surgeons, and to give them as much intensive medical training as possible, is much more important for medical officers in war time than intensive military training. (Applause.) At Oglethorpe, a preliminary medical examination was given each officer to determine his fitness to take any special work he might elect, before he was allowed to enter the class, and at the end of the course final examinations were given to determine whether or not he would be retained in the Surgeon General's office "as qualified" in any special branch of medicine or surgery.

Any success the Division of Head Surgery may have attained was not due to the efforts of any one individual, but to the energy and faithful work put into it by each of the officers assigned to duty in this division under the guidance of the Surgeon General and his corps of officers.

THE U. S. A. HOSPITAL FOR HEAD SURGERY.

J. M. Ingersoll, Lieutenant Colonel, M. R. C.
CLEVELAND, OHIO

As soon as we entered the war the Medical Department of the army began to arrange for hospital accommodations for the returned sick and wounded soldiers. Naturally the type of buildings to be selected for this was either buildings which were already being used as sanitariums and hospitals or buildings which could be easily converted into hospitals, and various buildings of this type were considered along the Atlantic Coast. As soon as it became known that the government was interested in leasing buildings for hospital purposes nearly all of the hotels on the eastern coast were offered to the government. In many cases the owners of old abandoned buildings became so patriotic that they were willing to lease these buildings indefinitely to the government at exorbitant prices. I spent the major portion of one day in making a trip with one of the men from the Surgeon General's office, who had been sent by the government to inspect a building which the owners were urging the government to lease. We found an old dilapidated three-story building which had been used as an academy and abandoned probably thirty or forty years ago on account of its dilapidated condition. On the other hand many fine modern buildings were offered to the Medical Department. One day while walking along the board walk in Atlantic City with one of the men from the hospital division of the Surgeon General's office I looked up at one of the large modern hotels there and said to him, "That would make a good hospital building," and he replied, "Yes, we can have it if we need it. Plans for converting it into a hospital have already been discussed in the Surgeon General's office." Among the modern fireproof hotels which were leased for hospital purposes was the one at Cape May, N. J., and the division of Head Surgery in the Surgeon General's office, which was under the direction of Col. W. R. Parker, secured this hotel for the work in Head Surgery. In the Army, the hospital was known as The U. S. A. General Hospital, No. 11, or The Hospital for Head Surgery. The location was an ideal one for a hospital of any kind. The building is on the extreme southern tip of New Jersey, projecting out into the ocean which almost surrounds it.

In January, 1918, the work of converting the hotel at Cape May into a hospital was commenced. The building was renovated, all carpets and floor coverings were removed, leaving well-laid tile and cement floors throughout the building. Some of the necessary equipment for hospital work was delivered during February and March, but at first the equipment was quite limited. In the Oto-Laryngologic department it consisted of the regulation army nose, throat and ear case, which contained only the necessary instruments for making a routine examination, and a tonsillectomy outfit and some of the more essential instruments needed for a mastoid operation. As soon as new equipment could be secured by the government it was sent to the hospital, and eventually all of the departments of the hospital were very well equipped.

The work of the hospital was divided into various sections. The Section of Brain Surgery and Peripheral Nerve Injuries was under the direction of Lt. Col. Chas. H. Frazier. The Ophthalmological Section at first was under the direction of Major Burton K. Chance, and later Major Meyer Wiener was made Chief of this section. The Oro-Plastic section was under the direction of Lt. Col. V. P. Blair. As Col. Blair was the head of the Oro-Plastic section in the Surgeon General's office he spent only part of his time at No. 11, and in his absence Captain Lee Cohen was in charge. The section of Oto-Laryngology was under the direction of the writer. The work in the different sections could not be divided by any inflexible rule. For instance, the brain injuries almost invariably involved the eye or the nose also, and the other departments all overlapped in a similar way, so that practically all of the cases in the hospital were seen by two or more of the departments. Fortunately there was good team work between all of the departments and the cases were studied in consultation and the various problems worked out. This spirit of cooperation and harmony added much to the general efficiency of the work done and also to the interest of the work.

Associated with me in the Oto-Laryngologic department were the following men: Major Gordon Berry, Capt. H. F. Lampe, First Lieut. F. N. Bigelow, First Lieut. E. P. Longaker, First Lieut. H. J. Beard. Capt. H. P. Cahill was also a member of the Oto-Laryngologic staff until August 10, 1918, when he was assigned to Unit 115, and went overseas. All of these men were well trained, capable workers, and our associations in the work was always pleasant and profitable to all of us.

On April 1st, 1918, twenty-six ear cases were transferred from the General Hospital No. 2 to the hospital at Cape May, and following this the number of patients in the Oto-Laryngologic Department constantly increased. At first the more difficult cases from the cantonments in this country were sent to the hospital. On July 1st, 1918, the first patients from overseas were received and from this time on, the number of patients in the Oto-Laryngologic Department averaged between one hundred and one hundred and fifty. The new patients were all examined immediately upon their arrival at the hospital and assigned to the different departments, unless there was some suspicion of an acute infection or contagious disease. All suspicious cases were sent immediately to isolation cottages and kept under observation until the acute symptoms subsided or a positive diagnosis of contagious infection was established. Cultures were made from the throat of all incoming patients and a few diphtheria carriers were found. These cases almost invariably had enlarged tonsils and a tonsillectomy usually cleared up the condition.

The injuries to the nose and accessory sinuses and the surrounding tissues varied greatly in extent and character. In a number of cases a portion of the bridge of the nose, high up on a level with the eyes, had been destroyed by machine gun bullets, leaving a depression which often involved the frontal sinuses. In one case both eyes had been destroyed and the anterior lobes of the brain exposed. In some of the cases one eye only had been destroyed and in a few cases both eyes escaped without serious injury. In a number of cases machine gun bullets had passed diagonally through one eye and the nose and mouth and out through the opposite side of the neck. As is usual in all such cases the lesion at the point of entrance of the bullet was small but at the point of exit the tissues were badly torn, leaving large irregular scars. In all of these cases plastic operations were done to remedy the deformities and remove the scars. Pieces of shrapnel and high explosive shell were found in all portions of the head, face and neck. Shell fragments were found in all of the accessory cavities, more frequently in the maxillary sinuses than in any other single place. These fragments usually entered through the cheek and a fistula persisted in the cheek. All of these cases were operated upon through the canine fossa, and as soon as the maxillary sinus was cleaned up and drainage established the fistula in the cheek healed, leaving a depressed scar which was later removed by a plastic operation.

There were a number of cases in which the bullet or fragment of shrapnel passed through one maxillary sinus then both nasal fossae and the opposite maxillary sinus and out through the opposite cheek. In all of these cases, there were numerous adhesions and considerable destruction of the intranasal structures. These conditions were remedied by intranasal operations. The radiographs frequently showed small pieces of shrapnel or shell in the ethmoid laryrinth, many of which were encapsulated and caused no symptoms and were left in position. One case had a piece of high explosive shell, about one centimeter square, lodged in the septum between the two sphenoidal sinuses. The fragment had entered the cheek a little below the external canthus of the right eye, passed under the orbit, through the posterior ethmoidal cells into the sphenoidal cavities. Immediately following the injury the sight in the right eye was impaired but gradually returned to normal and as the fragment caused no further trouble it was left in position. We saw a number of cases in which the principal injury was confined to the tip of the nose and a few cases in which practically the whole nose had been destroyed. In all of these cases the deformities were remedied by plastic operations.

The wounds involving the jaws and teeth often involved the floor of the nose also. The work done by the dental department for these jaw cases was of the highest type and the skill of the men in this department was admired by all of the staff.

The laryngeal cases were in some respects the most difficult type of cases which we had to deal with. There were some cases in which the bullet or shell fragment destroyed only the superficial tissues along the side of the larynx, causing a unilateral laryngeal paralysis. There were some cases in which the shell fragments passed through the neck destroying the laryngeal cartilage and the intralaryngeal structures, followed by the formation of adhesions causing laryngeal strictures which necessitated a tracheotomy. Laryngeal fistula existed in almost all of these cases and after removing the foreign bodies and the necrotic tissue and establishing free drainage these fistula healed very slowly. The laryngeal obstruction caused by deformities and adhesions were difficult to relieve, but in most cases persistent dilatation, and what Dr. Chevalier Jackson calls the Orthopedic treatment of the larynx, eventually enabled us to remove the tracheotomy tube. The voice in these cases was much impaired, but in no case was it entirely destroyed.

The wounds around the mastoid region were caused by pieces of high explosive shell, shrapnel, hand grenades or bullets. The size of the pieces varied greatly. Many of them were small pieces imbedded in the soft tissues and bony structures. Some pieces were about a centimeter square. The largest piece which we saw was ten centimeters long and about one centimeter in diameter. This piece struck the soldier about the middle of the mastoid and penetrated through the mastoid and middle ear into the articulation of the jaw. In most of the cases of wounds in the mastoid region the fragments penetrated the mastoid, destroying more or less completely the external auditory canal and injuring the facial nerve. All of these cases were deaf in the injured ear, due either to destruction of the cochlea or to concussion. Many of the cases of facial paralysis recovered almost completely when the foreign body and splinters of fractured bone were removed, thus relieving the compression and irritation of the facial nerve.

There were a few cases of gunshot wounds of the auricle only, with synechia of the auditory canal. These conditions were rectified by plastic operations. Most of the injuries of the ear and mastoid were due to primary wounds in this region, but we had some cases in which a machine gun bullet entered some other part of the head and went out through the mastoid. One man was struck by a machine gun bullet which entered the nose at the junction of the right ala with the cheek, passed through both nasal fossae through the articulation of the left jaw and out through the left auditory canal and mastoid.

We had about one hundred and fifty cases of Otitis Media Suppurativa Chronica. In two-thirds of these cases the chronic suppuration existed prior to military service and these cases should have been excluded from the service, as many of them were simply a drag upon the organization. In some cases the discharge was probably so slight when the men enlisted that they were able to conceal it. The unavoidable exposure accompanying life in the trenches almost invariably caused reinfection of these damaged ears, and the men were returned to this country. One-third of the chronic suppurative ear cases developed in line of duty. We used various methods of treatment for the suppurative cases. The method which gave us the best results consisted in carefully cleaning the ear with little pledgets of cotton and then applying, on a pledget of cotton, one or two per cent oily solution of Dichloramin T. The Dichloramin was applied daily or

two or three times a week according to the tolerance of the patient. In some cases daily application acted as a decided irritant, but an application two or three times a week proved beneficial. Treated in this way the suppuration in the ears in most of these cases ceased and the hearing usually improved somewhat.

There were thirty cases of bilateral deafness due to concussion. In these cases the labyrinthine reactions were all diminished, but not destroyed, and the deafness which was complete immediately after the injury almost invariably improved somewhat, so that the patients could hear a loud voice at a short distance and were able to hear their own voice and modulate it, and thus avoid the monotone which is present in congenital deafness.

We had a few cases of deafness following meningitis which showed no improvement in hearing. We also had a few cases of acute mastoiditis, one case of sinus thrombosis, and one case of meningitis of otitic origin. Excluding the cases which we operated upon on account of foreign bodies and injuries of the mastoid the number of mastoid operations was comparatively small. We had only two cases of hysterical deafness, both of which recovered.

The total number of cases of bilateral deafness in the American Expeditionary Forces up to March 1, 1919, was one hundred and six and they were all sent to No. 11. About thirty per cent of these were cases of concussion deafness. Two per cent were due to cerebro-spinal meningitis. Sixty-eight per cent were due to chronic bilateral suppuration.

All of the deaf patients were given instructions in lip reading. The section of Defects of Hearing and Speech was under the direction of Col. C. W. Richardson, and he secured for this work some of the most capable lip reading teachers that could be found in this country. The skill and loyal work of these women is deserving of the highest commendation.

Each deaf man received individual instruction, beginning with a period of forty-five minutes daily and then increasing the periods so that each man met his teachers two or three times a day. Under this system of concentrated teaching the majority of these men made wonderful progress, and in from six to eight weeks many of them became very expert lip readers. I wish to emphasize the value of intensive instruction for deaf patients. The rapid progress which these deaf soldiers made in lip reading convinced us all that intensive training was decidedly better than a prolonged course of instruction with intervals of a day or two between lessons. The skill which they attained in lip reading

also demonstrated that deafness is not so much of a handicap as we had formerly considered it to be.

The work of the teachers in speech defects was also very interesting. We found that many of the cases of jaw injuries were decidedly benefited by instruction in the proper use of the voice and that the vocal exercises given to them not only benefited their speech, but strengthened and reeducated the muscles injured or partially destroyed by the war wounds.

All of the work at the Hospital for Head Surgery was intensely interesting. The good team work between the various sections kept all of the sections in touch with the work throughout the hospital and was of mutual advantage to the hospital staff and the patients.

OPHTHALMIC EDUCATION AND TEXT-BOOKS

CLARENCE LOEB, A. M.; M. D.
CHICAGO, ILL.

Several articles have appeared in the last few years dealing with the question of Ophthalmic Education. Various admirable suggestions have been made treating of more thorough instruction in the subject of ophthalmology, advocating more attention to it on the part of those responsible for the curricula of medical colleges, and, in general, emphasizing the importance of a knowledge of ophthalmology for a student intending to do general practice. These papers I do not desire to discuss, except to approve most heartily of anything that will improve medical education and more especially ophthalmic education. But it does not seem to me that these improvements go far enough, or rather, it does not seem that they are attacking the problem from the correct angle. While they would result in improvement, might not greater progress be obtained if somewhat different methods of teaching were employed than those now in use? If we are traveling along a narrow and method-rutted path, is it better to patch up the old one or to survey a new one, if opportunity offers for such a course?

I realize that in advocating a change, I am running counter to two great forces: that of the inertia which tends to crystallize methods, and that of the opinions of men of far greater experience in teaching that I have had, men who are honestly convinced that they are obtaining the best results with their present methods. But I submit that they may not be the best men to observe the defects of the system; that the very fact of their long and successful experience may have brought about a routine that makes them unable to detect flaws that are palpable to one whose viewpoint is somewhat removed. I further submit that the fact that their students are able to pass a creditable examination both at the time of graduation and later before State Boards of Health is no evidence that they are qualified medical practitioners. It is simply proof that they knew the answers to the questions asked, with the presumption that they were equally well equipped to answer any other question, but is no criterion of their future ability in the actual practice of medicine. And I think this contention is supported by the fact that all schools advocate, and many

require, a year or more of hospital training. If the instruction these students have received in the schools is sufficient to prepare them for the practice of medicine, why is it advisable for them to spend a year or more in a hospital? Evidently, first, to enable them to actually perform or to assist in the performance of operations which they have witnessed or herely heard of as medical students, and secondly, to acquire proficiency in the diagnosis and treatment of medical cases. That is, the schools admit that the theoretic information that they impart must be supplemented by practical work, which their clinics, highly organized and well conducted as they are, do not furnish.

The charge that has always been brought against schools in general, is that they are too theoretic; that they do not fit their graduates for everyday problems. I think it would be more correct to accuse them of not equipping their graduates to apply promptly and properly the information that they have imparted. The student leaves his school with his brain crammed with valuable knowledge, but without a proper idea of how to utilize it. He is like Kipling's ship before it found itself. His mental machinery functions, but there are slips, hesitation and stress, instead of a perfectly coordinating whole.

In the Race of Life, we often see the honor graduate fall behind those whom he outranked in the school, and the cause for this, as I see it, is that the latter have learned better how to utilize the knowledge which they acquired. Other factors such as family connections, personality of the individual and pure accident of course enter into the problem, but I think that the former reason will be found most frequently to account for the success of some and the failure of others. What is true of schools in general, is true of medical schools in particular. Knowledge alone does not make a good instructor; he must have the ability to impart it. Knowledge alone does not make a successful physician; he must have the ability to utilize it. Theoretic acquaintance with a dozen different methods of operating for strabismus, for example, is far less valuable to the individual than a time-tried experience with one.

In developing my thesis, I have been and shall be compelled to refer to medical education in general, for ophthalmic and otolaryngologic education differs not in character from general medical education, but only in the special methods applicable to the subject, as for example, instruction in the use of the ophthalmoscope instead of the laryngoscope or the stethoscope. There-

fore, if what is said of ophthalmic education is true, it is likewise true of oto-laryngologic and general medical education, and vice versa.

Medical education is a combination of didactic and clinical teaching; that is to say, the instructor either describes a condition such as cataract, otitis media, typhoid fever, etc., or he demonstrates a case, analyzing its features. I am referring only to the method of teaching the recognition of diseases, that is to say diagnosis.

Of the two methods of teaching, I venture to say that the majority of students prefer clinical instruction, because the case is there before them, and knowledge acquired thru the sense of hearing is supplemented by that acquired through the senses of sight and touch. The mental picture thus formed is distinct and lasting—sometimes. So true is this that after a demonstration in the clinic, the student can usually describe the disease as it appeared to him. But now a curious phenomenon takes place. If a little time is allowed to elapse, so that this picture becomes somewhat blurred, and then a similar case is placed before the same student, he will frequently, if not usually, be unable to diagnose it. But if then told that it is a case of cataract, for example, he will proceed to describe it, with all of its symptoms. The reason for this, which all instructors have witnessed, is the faulty method of instruction and not the lack of ability of the instructor, or the lack of receptiveness of the student. The latter is taught diseases by *names* and not by *symptoms*. His mind focuses upon the fact that cataract, otitis media, typhoid fever or whatever the case may be, is a disease characterized by a certain group of symptoms, and slurs over the fact that what actually occurs is that a group of symptoms such as decrease in sight, absence of the fundal reflex, white mass in the pupillary area, etc., makes up the clinical picture of a disease to which we give the name of "cataract." He may know that these symptoms are present but he cannot fuse them into a clinical entity, while he is quite capable of analyzing cataract into its symptomatology. In terms of a homely illustration, he puts the cart before the horse, or to use an illustration from our own specialty, he is looking at the image instead of the object.

It might be called hairsplitting to make a distinction between saying that cataract is a disease characterized by a certain group of symptoms, and saying that a certain group of symptoms make up the clinical entity called cataract, but there is a distinct psycho-

logic difference between the two statements. In the former the mental attitude is analytic; in the latter it is synthetic.

If a recent graduate, especially one who is preparing for a State Board, is told to examine a case of typhoid fever, for example, he will probably demonstrate all of the symptoms present, or at least most of them, because he has been taught that in typhoid fever certain symptoms are found, and he will know what to look for. But if the same man is given an unnamed case to diagnose, he will hesitate, probably find a couple of symptoms, but will be unable to combine what he has found into a clinical entity, or to search for additional symptoms, because he has not been taught how to do this. If he makes a correct diagnosis, it will usually be a lucky guess. As I said before, he knows diseases by names, not by symptoms.

Now, when this student enters into the practice of medicine, either in private practice or as an interne in a hospital, it is the opposite condition which confronts him. The disease comes to him without a name, or if named by the patient, frequently if not usually incorrectly named. The history may or may not be helpful or reliable. He must synthetize instead of analyze, and is handicapped by his inability to reverse his mental pictures. In a hospital, his senior or visiting man can assist him, but "on his own" he has a difficult task even in the conditions easiest to diagnose. He guesses a name of a disease, and then tries to fit the symptoms of the disease he has in his mind to the disease he has in front of him. If he fails, he guesses another one, and so on until success crowns his efforts. How much better equipped he would be, and how much easier his task would be, if he had been taught first, to look for symptoms, second, to look for symptoms, and then again to look for symptoms, and only when all had been found to combine them into an entity. This he must do sooner or later if he wishes to become a successful practitioner, and how much better it would be for him to learn it in the school, where the responsibility for the patient is on the shoulders of someone else!

The members of this association are physicians of recognized ability, many of them instructors of wide repute, who have been engaged in the practice of our specialties for periods of varying lengths. It can be well assumed that their experiences have been those of a majority of oculists and oto-laryngologists, and that their opinions will correctly reflect that of our profession as a whole. As men whose first interest is the advancement of our

specialties, let me ask the oculists how many of you could immediately and unhesitatingly give all the symptoms of acute iritis for example? Probably all. Well and good! Now let me ask another question. Let me pick out one of the symptoms of acute iritis, say circumcorneal injection, and ask how many could as unhesitatingly name all of the diseases in which this symptom appears? I do not mean the diseases in which this symptom appears as one of the cardinal symptoms, as for example acute glaucoma, but the diseases in which this symptom is found, no matter what its importance may be, because we must remember that symptoms do not come to us labeled cardinal or insignificant. Their relative importance is learned only by years of constant study and repeated experiences. I frankly confess that I could not name off-hand more than half a dozen or so, say iritis, iridocyclitis, interstitial keratitis, corneal ulcer, glaucoma, phlyctenular keratitis, and perhaps a couple more. But upon thinking the question over, I find that it is present at some time in the following diseases, in addition to those already mentioned; foreign body on the cornea, superficial punctate keratitis, keratitis profunda, descemetitis, staphyloma of the cornea, episcleritis, scleritis, staphyloma of the sclera, burn of the cornea, abrasion of the cornea wound of the cornea, wound of the sclera, rupture of the sclera, tumor of the iris, iridodialysis, traumatic colobma of the iris, traumatic aniridia, panophthalmitis, sympathetic ophthalmia and traumatic cataract, and then I am not sure I have named all! Then there are other lesions where this symptom is present as the result of some complicating condition such as sarcoma of the choroid, as the result of a status glaucomatosus, and foreign body in the eye, for the same reason or because of a complicating panophthalmitis.

Now, in order to make a diagnosis of a case that presents the symptom of circumcorneal injection, the oculist must be able to recall almost instantly at least a large part of the above disease, and if this is sometimes difficult for men who have been in practice for a dozen or more years, and have met these diseases more or less frequently during that time, how much more difficult it must be for a beginner, who has not learned from experience which can be instantly excluded on account of the absence of other equally important symptoms!

It might with justice be asked how can a doctor have all of these diseases in his mind? Isn't that what text-books are for? To this I would reply that if our ophthalmic training had been along the proper lines, such a task would be no more difficult than

to remember an equal number of symptoms of any one disease. But the student is not taught thus. He is taught to remember symptoms from the names of diseases. No, that statement is not strictly true. He is taught that a certain disease is recognized from the presence of a certain group of symptoms, whereas he should be taught that a certain symptom may indicate the presence of any one of perhaps several diseases, whose further diagnosis must be made by means of the recognition of other symptoms, each of which in turn may be present in more than one disease. Pathognomic symptoms are rare indeed. By a process of exclusion of diseases in which one or more of the symptoms present in the patient are not found, the diagnosis may be made.

As a matter of fact, is that not the way that the experienced physician makes his diagnosis, whether consciously or not? He groups the different symptoms present into a mental picture which recalls a symptom complex that he knows as a certain disease. In doing so, he has mentally excluded disease after disease which one or more of the symptoms present has called up, but which does not correspond to the entity of all the symptoms. But the point which I wish to emphasize is that he has learned to do this not in the School of Medicine, but in the School of Experience.

Now as to text-books! A text-book of ophthalmology, in general, consists of a series of descriptions of diseases grouped according to the particular part of the eye which they exclusively or chiefly involve. For instance, a chapter will be devoted to diseases of the iris, although there is certainly no clinical or pathologico-anatomic resemblance between an iritis, a sarcoma of the iris and a coloboma of the iris. Their only point of relationship is the fact that each primarily affects the iris. There is more danger of diagnosing an iritis as glaucoma than as coloboma of the iris, and it would seem more logical and certainly easier for the student to bracket the two former together for purposes of comparison and differentiation. But this is a minor point. Some form of division must be followed, and no doubt equally weighty objections could be urged against any other method.

The description of each disease is more or less roughly divided into five parts: (1) definition of the disease, (2) etiology, (3) symptomatology, (4) pathologic anatomy, and (5) therapeutics. In addition, there may be a description of the normal anatomy and physiology of the tissue affected, either at the same place or elsewhere in the book. Furthermore, there is more or less lengthy discussion of refraction and the principles of physiologic optics. The value of the text-book is directly dependent on

the correctness of its statements, the amount of information it contains, and the accessibility of the latter. For mere size is no criterion of value, if the information is so scattered and voluminous as not to be readily comprehended. Now, there is no question that text-books so written are of great value, whether they are small ones, for students' use, or encyclopedias, for more extensive investigation. The objection which I have to urge against all of them is that to make use of them one must know beforehand what disease he wishes to study. If we have a case which we know is glaucoma simplex, for example, and we wish to supplement our knowledge of this disease, they serve the purpose admirably. But if we have a patient complaining of a loss of vision, and we wish to find out what is the matter with him, we can read up on atrophy of the optic nerve, the various forms of neuritis optica, retinitis, etc., that is, those diseases whose *names* we can recall, but when we have finished with that list we are at a loss. There is no text-book which we can consult that is arranged to show in what diseases loss of vision appears as a symptom. It is true that each book has an index to which we can refer. Let us take up one of the best and most popular of the larger text-books and turn to the heading "vision." We find that there are references to "dimness of vision," "loss of vision," and "obscurity of vision," all having the same page number. We find that it refers to amblyopia, amaurosis, and disturbances of vision without ophthalmoscopic changes. The chapter describes well those conditions of which it treats, but it is not what we want; that is to say, it does not give a list of diseases, one of whose symptoms is decrease in sight. What can we do? We can either search through the book for other diseases causing loss of vision, or we can ask for a consultation with someone who may remember some other diseases, and thus assist us in arriving at a diagnosis.

Let us be frank! We have all made mistakes in diagnosis, or if we will not confess that, we will all admit that we have had cases in which other men, our equal if not our superior in ability, have made mistakes. If you will recall such cases, you will find that the cause of your colleague's failure and your own success was usually that he did not recognize the importance of some symptom. It did not fit in the mental picture he had formed of the disease, and he had dismissed it as atypical or unimportant. You, on the contrary, remembered that it occurred in another disease, which was portrayed equally well by the group of symptoms present, and therefore you were able to make the correct diag-

nosis. If the text-books of your colleague had been arranged so that he could have seen at a glance the names of the diseases in which this neglected symptom appeared, he would have been able to make the diagnosis as well as you, because he could have read the descriptions of the various diseases until he found the one which fitted the symptom complex present.

It seems to me that text-books will be incomplete until they consist of two parts, each equally valuable. If I lay more stress on the one than on the other, it is because it has been neglected. The first part should describe symptoms and explain their significance, that is, should state in what diseases they are found and what they indicate. For example, by decrease of vision we mean the inability of the patient to read the six meter line of the test card at six meters distance. Among other diseases, it is found in mature senile cataract, and is caused by the interference of the opaque lens with the passage of rays of light to the retina. The second part of the text-book should consist of the present text-book, with all of the information at our command, arranged in a manner that will permit it to be readily grasped and utilized. The present text-books are complete so far as they go, but to consult them, one must have an idea of what he wants to look up. They are like a dictionary, valuable for one who wishes to look up the meaning of a word, e. g., nystagmus, but of no use to a man who sees certain movements of the eyeball and has forgotten their name.

This, then, is the complaint which I bring against ophthalmic education, and for that matter, general medical education, that it does not cultivate in students the mental attitude that will prepare them for medical practice as it actually exists. This can be accomplished more efficiently by teaching them first of all to recognize the symptoms of disease, for example, how to test for increased ocular tension; secondly, by explaining to them the significance of each symptom, e. g., what are the pathologic changes which operate to cause an increase in ocular tension; thirdly, by informing them of the names of the diseases in which each individual symptom appears, e. g., increased ocular tension is found in acute inflammatory glaucoma, chronic inflammatory glaucoma, chronic simple glaucoma, and the various conditions which cause a status glaucomatosus; fourthly, by teaching them to combine the various symptoms present into a disease complex, by mentally reviewing the several diseases in which these symptoms are individually present, until one is found which exhibits them all; and fifthly, by teaching them, as is done now, that a

disease shows certain symptoms, so that they may confirm a diagnosis made as above by finding other symptoms which they have overlooked.

I do not claim that the men so instructed will become absolutely faultless diagnosticians, but I do claim that when they graduate they will be better qualified to make diagnoses than they are under the present system.

Finally, in regard to text-books. Their purpose should be to broaden our mental horizon by presenting to us facts which we remember, facts which we have forgotten, and facts which we never knew. Whether forgotten or unknown, they are useless to us, unless accessible, and the present method of compiling text-books does not fulfil this desideratum. They must be so altered that it may be possible to obtain almost at a glance the information which we desire, and this means above all an arrangement by which we can pass readily from a recognition of symptoms to a recognition of disease. Then only will we be ready to appreciate the additional information which they convey.

DISCUSSION

Dr. Edw. Jackson, Denver, Colo.: I think we are indebted to Dr. Loeb for bringing us to look at our teaching and our text books from a new point of view. We will certainly understand them better for having done so. I have thought medical education is best carried on along two independent lines. The subject of ophthalmology or oto-laryngology can be learned by each practitioner from two different sides. First as a branch of science with certain relation between its different parts; certain relations between anatomy, causes and symptoms, treatment and prognosis. That is what we have in the average text book or article, so that in a particular disease these relations are brought out; and it is necessary to have them in order to quickly command what knowledge we have.

But, it has been more and more realized, in the last forty years, we must have another way of looking at disease—that put before us by Dr. Loeb—taking the symptoms most evident, and from them reasoning our way, to apply the systematic academic knowledge that has been acquired. The changes that have been wrought by this realization have been in regard to laboratory and particularly clinical teaching.

The medical course as we have it now is probably right in establishing the student first in the difficult fundamental branches, and the study of disease from the scientific side. After the student has become acquainted with the general field of medicine, he must study it over again, to be able to cope with the individual case that comes before him. That is what is meant by the clinical years in a medical course.

We have not yet reached a right balance between the two; the clinical side needs to be still further developed. Too much importance may still be attached to the former, that is too much is made of it, and not enough of time given to the particular study of cases. But still there has been a great advance in 40 years in that direction.

We deal with words and we deal with the things they represent. But the word is of little value until it stands for its full, clear meaning in the mind of the student. That is where the necessity for laboratory work and laboratory methods comes in. In the University of Colorado we have had for several years what we call "demonstration courses." In ophthalmology the course includes the actual use of lenses; experience with them as to focusing of light. The lenses are actually handled and worked with before any instruction is given on refraction of the eye. The lens is tried on the students themselves, so that they see the effects of myopia or astigmatism. In that way the later didactic and book instruction becomes much more valuable.

Methods of examination are put into the actual experience of the student. The ophthalmoscope is used first by the students on each other. It can be learned much more quickly that way than by attempting its use on patients. The instrument is explained; the conditions under which the fundus is seen are explained; and then nine out of ten see the fundus the first hour they attempt it, and the majority of them see the details. This is in strong contrast to the old method of teaching, where a man said he was six months in one of the large eye hospitals of our country before he could see the fundus image.

But the heart of Dr. Loeb's contention is closely allied to the difference between a dictionary and a thesaurus. The thesaurus is arranged with the thought first presented, and from it you find the proper word. But it never changed the popularity of the dictionary. You look for cataract in a text book and find under that name the symptoms, causes and complications, treatment and prognosis. This resembles a dictionary. But to have the symptoms grouped as in a thesaurus, while it may be extremely valuable, would not replace the other way. If we could get a book arranged in that way it would be very valuable, but the one cannot replace the other.

Dr. Meyer Wiener, St. Louis: In the paper just presented by Dr. Loeb in which he has so carefully delved into the subjects of both text book instruction and medical school education, he has tried to bring out the point that a student, when confronted with the patient at hand, must make an examination, collect the symptoms and construct a diagnosis therefrom. Now this to my mind is what every teacher tries to accomplish and every good one succeeds in doing. The greatest fault in my experience, after many years of teaching in Washington University Medical School, and a most invaluable experience as director of the Army School of Ophthalmology at Camp Greenleaf, was not in the inability of the undergraduate or postgraduate student to construct a diagnosis from his findings in a given case, but to an almost universal lack of power of observation and systematic methods of examination. How is it that an experienced ophthalmologist glances at a patient and discovers that he has a foreign body in the cornea? He involuntarily perceives a pericorneal injection, which tells him that there is an involvement of the cornea, or the iris, or both. Whereupon he sees that the iris is clear or relatively so and finds the corneal affection. To my mind, the present method of teaching, didactic and text book, is correct in as much as it prepares a foundation for the student so that he may have a general working knowledge of the subject. This is supplemented later by clinical teaching, which must have for its prime object the emphasis on systematic examination of the patient. Beginning not with the eye, but with the patient's general physical appearance, any defect in gait; skin or scalp disease; defective or misformed teeth; diseased sinuses; careful examination of the external muscular movements, and so on, touching on each tissue in turn. I have seen a

student slip up on a diagnosis of incipient exophthalmic goitre, simply because he neglected to carefully observe the lid movements.

If one examines the conjunctiva carefully, he must be made to note not only that there is redness of the conjunctiva, but the character of the redness and the location; for if it is greater towards the periphery than toward the cornea he reasons that he has to deal with a purely catarrhal inflammation. If greater surrounding the cornea than in the periphery, he knows that there must be an involvement of the cornea or iris, or both. A lesion of the cornea must be described in detail; location, color, size, shape, outline; whether elevated or depressed, ability to take up stain. If it is an ulcer, whether the edges are sloping or undermined, clear or covered with slough, and so on. A lack of this systematic and careful training of the students' power of observation is to my mind the most serious defect in the education of the ophthalmologist. For example, should he find redness of the conjunctiva which is greater surrounding the cornea than towards the periphery, he looks for involvement of the cornea or iris. Should the cornea prove to be not involved, it must be by a process of exclusion an iritic affection. He must then carefully observe all of the signs which can involve the iris. That is color, shade, condition of pupil, shape and reaction to light and accommodation, surface markings and depth of anterior chambers, etc. If he starts with the lids and goes on through with all the tissues, systematically, he sums up his findings and can hardly fail to arrive at a diagnosis.

This answers Dr. Loeb's contention that he is looking for a disease instead of symptoms. If he finds certain iris abnormalities, for example, which puzzle or baffle him, then he consults his text book on the subject of iris and usually finds what he wants. If, in his ophthalmoscopic examination he finds that the media are not clear, it is his business to carefully find out what is causing this opacity. His primary external examination will have determined whether it is the cornea, aqueous or lens, perhaps. If it is in the vitreous, he can readily analyze the different conditions causing vitreous opacities. These *signs*, not symptoms, can always be referred to in any good text book, and the signs, not symptoms, are the all important factors making a diagnosis. Should the student in failing to bring up the vision of a patient, find a defect in the visual field, he reasons out from his physiology of the optic tract where the lesion must be located to produce such a field defect, providing there is no local inflammation or degenerative condition in the eye itself to account for it. In other words, it always brings us back to my first contention, which is that what we need is not so much a change in the arrangements of our text books or general methods of teaching, but to lay more stress than ever on the importance of a thorough systematic routine examination of all patients. Think of how much suffering could be avoided, for example, if all ophthalmologists would make it a routine part of their examination to determine the muscle balance for distance and near, of every refraction case. I am ashamed to acknowledge that a very large proportion of our colleagues are sadly neglectful in this one important routine. Symptoms are relatively of slight importance in making a diagnosis in ophthalmology. If a patient complains of night blindness, we immediately think of primary retinal degeneration. However, our routine examination of the fundus will reveal the lesions, even if we never have a word from the patient. If he complains of halo around the light, the same can be said for our careful external examination, for the patient will show shallowness of the anterior chamber, diminution of the range of accommodation, defects in the visual fields, increase of tension, or at least some of these signs or all of these signs, in the summing up of which, or, as Dr. Loeb suggests, the synthetic building up of a diagnosis. Dr. Loeb gives blindness or defective vision

as an example. Now a careful routine systematic examination will tell whether this defect lies in the cornea, aqueous, lens, vitreous, or whether this defect lies in the fundus. Or in the absence of any physical changes in the eye for example, field defects might enlighten us. The student must be made to analyze the disease first in order later to construct from his collection of signs, that disease. In other words, we must have analysis, or at least it is better to have both.

Dr. Loeb states that the student guesses the name of a disease, and then tries to fit the disease he has in his mind with the one he has in front of him.

It is not necessary to name all of the diseases which may cause circumcorneal injection, for the student when he finds this sign of injection, goes further to find what tissues are involved, and then sums up his findings. In other words, Dr. Loeb is, in my opinion, on the wrong track in trying to make a student even think of a diagnosis from a single symptom or sign, but should insist on the carrying out of our systematic routine, and then summarize all of the findings. It is not necessary, as Dr. Loeb contends, to know what "disease" we want to study in referring to text book. It is only necessary to know the change in the tissues involved, and these are carefully analyzed in all the good text books. If we start out to explain symptoms complex we place the cart before the horse, for then when we say that dimness may be caused by cataract, keratitis, retinitis, atrophy, etc., it presupposes a knowledge of what these conditions are.

To reiterate, the disease must first be analyzed before it can be reconstructed from a summary of the findings.

I think a book such as Dr. Loeb suggests would make an excellent reference dictionary of ophthalmology, but could not replace our present text books.

Dr. G. W. Boot, Chicago: I have been employed in teaching medicine between fifteen and twenty years and I feel that the text book that Dr. Loeb advocates would be radically wrong. When you meet a friend in passing along the street, how do you recognize him? Is it because you note that his eyes are blue, his hair white and his head bald? No. You recognize him not by any one thing, but by the whole assembly of his characteristics. You get the general view. The same must be true in learning to distinguish diseases, otherwise the physician remains the narrowest kind of a specialist. If Dr. Loeb has the correct idea about a text book you would learn chemistry from your book on qualitative analysis. You would learn minerology from your tables for the determination of minerals.

Th[illegible]e have been books written along the line advocated by Dr. Loeb. I recall one very good one of the kind by Dr. Hun on the Diagnosis of Nervous Diseases, yet I am sure it would be the last book a neurologist would give his class in order to teach them the intricacies of nervous diseases. Such books have a distinct place but it is not as text books for students.

If Dr. Loeb is correct the ideal book for a medical student would be the Homeopathic Dictionary of Symptoms.

On the other hand, a great deal of time may be spent getting useless data about patients. There is a limit to what is practicable. It is highly interesting to know the details of a blood examination, but if a patient merely wants an acne pustule opened it is a waste of time to do a Wassermann or a colloidal test on his spinal fluid.

The physician should know his business like the engineer who does not examine every bolt and nut on his engine if he hears a knock, but

almost intuitively goes to the place that is out of order and investigates that.

Dr. R. H. T. Mann, Texarkana, Texas: I do not think the text books are wrong; I do not think the methods of teaching are wrong; but I think we are not using pictures enough. The text books are deficient in pictures. If a man does not know the symptoms, if he can turn to a picture he will know them then. We should have entire picture books of diseases of the eye. We learn by seeing things. The eyes are to see with. The whole world is looking at pictures. Why not teach ophthalmology by pictures? I can learn more from a correct picture of a disease a hundred times easier than to sit down and read about it. It is so easy to look at the picture and learn. If we can get a correct picture of a disease then we will know the disease when we see it.

Dr. Allen Greenwood, Boston: I cannot help rising because I have some teaching work to do and have also assisted in the examinations and I am convinced most thoroughly that the most useful of all the requirements is the trained power of observation. That is the thing that most students lack for the power of trained observation needs training from early life onward.

Dr. Loeb (closing discussion): I am very grateful to the members who have discussed my paper, although it seems that most of them do not agree with me. Nevertheless, I repeat that I think the present method of teaching is wrong in theory, but if it could be used to supplement the method which I advocate, namely teaching the recognition of diseases by building up the symptom-complex from the symptoms present—and under symptoms I include signs—I think the students would be better able to recognize the disease the next time they saw it. Dr. Wiener said he was opposed to my position, but if you will analyze his remarks, instead of opposing it, he was really upholding it. For he said, "you see a circumcorneal injection and you think of a corneal infection, or an iris infection." That is just what I said that students should be taught to do, but are not. The experienced physician looks for the symptoms, and finds this or that one is present. He knows that one symptom is found in A, B, and C diseases; another in A and B, but not in C; a third in A and C, but not in B. By a process of elimination he diagnoses the disease to be A. But when he started out in practice, the manner in which he had been taught made him say to himself, is this a cataract? Then he proceeded to hunt for other symptoms of cataract. Failing to find them, he thought of another disease and searched for its symptoms, until he ran out of diseases or found the correct one. If he had been taught the synthetic method, of looking for symptoms and signs—I don't care which you call them,—and building these up into a disease complex, his task would have been much easier. Dr. Wiener said, as I did, that the first thing to look for is the symptoms and signs. I am glad that his students are taught that, but I believe the great majority of instructors still describe diseases. He claimed that a systematic examination of the patient will always give the correct diagnosis. For example, in a case of night blindness, one will always find the pigment if it is due to retinitis pigmentosa. But this is not true, because there are cases of retinitis pigmentosa sine pigmente. In such a case the diagnosis must be made by putting together the other symptoms present.

Dr. Boot's illustration was also unfortunate. In chemistry you learn more than mere analyzing. You also learn synthesizing, and as a matter of fact, in modern chemistry, especially organic chemistry, the greatest progress is in building up compounds from simpler forms, i. e., synthesizing. If chemists had confined themselves to analytic chemistry, in all probabilities the Great War would not have been fought, for it is well

known that Germany's wealth and power was largely based on her dyes and chemical products, all the result of synthetic chemistry.

Dr. Mann's desire for pictures is good, but you cannot learn from pictures alone. You can show a student pictures by the dozen, but the examination of one clinical case gives him more real and lasting information.

Dr. Jackson's remarks are those of one who has studied the question carefully, and who, himself, has written frequently upon this subject. Probable some didactic instruction is necessary, but I think it should be supplementary, not primary. I am glad that his opinions coincide with mine in so many particulars.

I agree with Dr. Greenwood that observation is all important. The emphasis should be laid, didactically or clinically, upon the symptoms and signs. The student should be taught how to find these, and having found one, two, three or more, how to build them up into a disease complex. That is the way we make our diagnoses today. We find several symptoms and from them we construct our disease. But when we started to practice, we thought "is this condition such and such a disease?" Then we tried to fit the symptoms present to the disease we were thinking of, and if we were fortunate we made a correct diagnosis, and if not, we had to make another attempt.

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JOHN M. WHEELER, M. D.
NEW YORK

Cicatricial ectropion is recognized as a difficult condition to handle satisfactorily. To get rid of the scar tissue responsible for the deformity, to cause the eyelid to lie accurately against the eyeball at the proper level, to get the effect of proper outline of the lid margins, to enable the patient completely and easily to close the lids, without adding any appreciable deformity in the process—this is not easy. On account of the exposure of the eye caused by the ectropion and on account of the glaring deformity, the correction of this condition is decidedly important. Through the contraction of the scar tissue and the overflow of tears the tendency is for the deformity to increase, if it is not rectified by operation. Unfortunately, no method of treatment has been generally agreed upon as superior to all others. In my mind the choice is made. For most cases of scar ectropion, transplantation of free dermic grafts offers by far the most satisfactory means of correcting the deformity. After a study of methods and comparative results obtained in wounded soldiers, no doubt is left in my mind. All of the ophthalmologists who served on the eye service at Fort McHenry, while most of the lid repair work was going on, thought alike on this point, and I have reason to believe that visitors who observed cases with us were impressed by the value and suitability of the method.

Cicatricial ectropion occurs much more commonly in the lower lid than in the upper, and in war wound cases it is often associated with fracture of the orbital margin and the bony structures nearby, particularly the superior maxillary and malar bones. Often, too, the ectropion is only one of several deformities. But correction of the ectropion is always very important.

It is not my desire to deprecate the value of other methods of caring for ectropion of the cicatricial type, but I should like to make it clear that my conviction is that no other method offers correction of the deformity with as good cosmetic appearance as the use of inlays of free dermic tissue. There are two other important means of handling cicatricial ectropion, namely, the use of epidermic grafts by one of several methods, and the use

of pedunculated dermic flaps. In considering the choice of method one cannot keep back the thought that the skill with which any operation is conducted is fully as important as the choice of operation. This certainly is true in regard to the matter under consideration. But a few things are unquestionably evident. One is that for a rule, skin characteristics are carried better by grafts made up of epidermis and true skin than can be possible by transplanting grafts of epidermis only, without the elements of true skin. Both theoretically and practically this is so. Theirsch (epidermic) grafts are best suited to cases of severe burns of the face with consequent loss of the normal color, texture and characteristic appearance of the facial tissues. In such cases the Theirsch graft is likely to match the surrounding burned skin well. Moreover, in some cases of the comparatively rare condition of ectropion of the *upper* lid the epidermic graft does well because it becomes inconspicuous in the shaded folds in this location. But here, even, the dermic graft gives a better cosmetic appearance, as a rule.

Pedicle flaps often fail partially of their purpose, and not uncommonly give a grotesque appearance. These flaps must be taken thick or their life is imperilled. Thick flaps are manifestly undesirable for lid grafts. Passive congestion which leads to the death of all or parts of so many pedunculated flaps, does not have to be taken into consideration in the use of epidermic or dermic detached grafts. Their life depends on contact with the underlying tissues, and blueness and death from impairment of old circulation cannot result. Anemia in thin free grafts is quickly followed by new vascularization and vitalization, provided proper contact with healthy underlying soft tissue is given. In using pedicle flaps it is not possible with safety for the flaps to accurately match the needed shape, which is almost always fusiform or crescentic. This is a serious handicap, particularly in view of the fact that in attempting to correct one deformity another appreciable deformity is made and subsequent secondary operation is almost invariably necessary. Much may be said in favor of pedicle flaps for many plastic procedures, but I know of little in their favor for lid work. Right here let me add that, if I mistake not, nothing has hampered the progress of plastic surgery so much as the idea that pedunculated attachment is necessary for the life and well being of grafts.

The favorite sites for the removal of true skin for grafting

are the inner surface of the arm, the temple and the upper eyelid. The arm graft is the most difficult to take, the most difficult to prepare and the slowest in assuming the characteristics of the surrounding tissues of the lids. It takes several months for the arm grafts to take on the proper color and in some cases they never do match quite accurately. The inlays from the temple match well in color immediately, and (if not too thick) in texture more quickly than arm grafts. The inlays into the lower

Fig. 1
Cicatricial ectropion of right lower lid. Dotted line shows position of primary incision

lids from upper lids match in all characteristics from the start. Little wrinkles and creases form early and two weeks after transplantation it is actually impossible in some cases to be sure of the outline of the grafts without putting the tissues on the stretch. These upper lid grafts are really beautiful and at Fort McHenry we found ourselves using them in preference to other grafts where only small inlays were used. The widest graft that we took from the upper lid was 20 mm. in width. There is no difficulty or risk in getting a length of 40 mm.

Operating Technic—Let us assume ordinary cicatricial ectropion of the lower lid. Restoration of the lid to its proper position, securing it in position, and preparation of the bed into which the graft is to be laid are important. A skin incision is made ordinarily a few mm. from the lid margin, approximately parallel with it and of about the same length as the palpebral fissure (Fig. 1). The subcutaneous scar tissue should be carefully and thoroughly dissected out. As a rule there is more cicatricial tissue than there appears to be, and one cannot be too

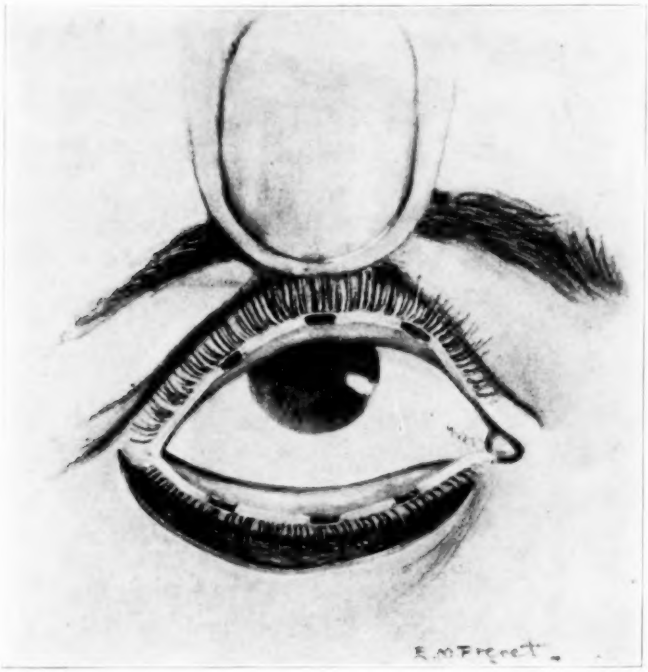


Fig. 2
Upper and lower eyelids everted to show denuded area on lid margins, where adhesions will form to hold eyelids together

painstaking in getting this all out of the lid. Care should be taken not to injure cilia follicles, tarsus or conjunctiva, and muscular tissue should not be sacrificed unnecessarily. After this dissection is completed the lid should easily go back into position. If the eyeball has been enucleated the lid margin should be anchored upward and backward to the orbital contents by sutures, in a position of overcorrection. If the eyeball remains, the upper and lower lids are sewed together and made to adhere to each other. This is important. The method practiced by

Weeks is excellent. The epithelium with a little of the underlying tissue is sliced away from the lid margin with a fine knife, such as a cataract knife, at three corresponding places in the upper and lower lid margins, with care not to injure the cilia follicles. These little denuded areas should be about three millimetres long and should be placed approximately in the center and midway between the center and each end of the lid margin. It is important that the position be the same in the upper lid as

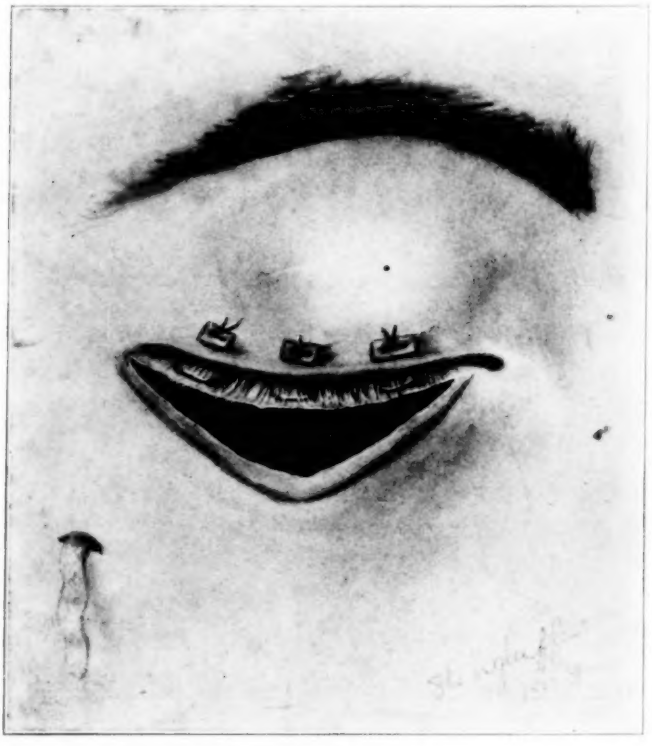


Fig. 3
Sutures introduced to hold eyelids together. Sutures have been passed through denuded areas on lid margins, and tied on small rubber plates

in the lower (Fig. 2). Then sutures are placed to hold these denuded areas in close apposition. Double armed sutures are used. The needles enter the skin of the lower lid near the margin and pass through the denuded areas of the lower lid margin. Then entering the denuded areas of the upper lid margin, come out through the skin near the eyelashes and are snugly tied. If the sutures are passed through little rubber plates they will not cut into the skin under the dressing (Fig. 3). After the

lids are secured in this way, the raw surface which is to receive the graft should be put on the stretch by adhesive plaster above and below, or better by relaxation sutures tied over little plates of rubber, little gauze pads, pearl buttons or some other material so that the sutures will not cut in. When this process is completed the smooth raw surface which is to receive the graft is stretched and usually of imperfectly crescentic or fusiform shape. There should be no ligatures in this bed and there should be no opening into the conjunctival sac. In the dissection, pressure and pinching of vessels with artery clamps will control hemorrhage; and there need be no fear of postoperative hemorrhage, as a very firm pressure dressing is applied.

Taking the Skin Graft—The stretched denuded area to receive the graft should be measured, or a pattern of the area can be cut if the operator wishes. If the skin is to be taken from the inner surface of the arm the length and breadth of the graft should be about $\frac{1}{3}$ greater than those of the stretched bed on which it is to be placed. If taken from the temple or upper lid the dimensions need be only slightly greater than those of the bed, as there is practically no immediate contraction of this skin when removed. Of course, in mapping out the incisions for the graft the skin should not be stretched with the fingers but left relaxed. In dissecting up the skin, care should be taken not to injure the graft unnecessarily. After practice a dermic graft can be taken without taking hold of it with forceps or pinching it with anything. Traumatism to the tissues prepares them for death and not for life. I feel strongly about this. After removal, skin from the arm is found to be elastic and it has a disagreeable tendency to curl. Skin from the upper eyelid has these characteristics to a much lesser degree, and that from the temple practically none at all. The temple skin lies flat and is very easy to handle. All subcutaneous tissue should be cut away by laying the graft on a pad of gauze saturated with warm salt solution, and snipping away subcutaneous tissue with flat scissors. When this is done the graft should look anemic. The temple graft looks and feels slightly granular, as well. In preparing dermic inlays one need not fear making angles or points, as they will take as surely as any part. After preparing the graft the surgeon sews it in place with interrupted sutures. These should be carried through just at the margins of graft and surrounding skin (Fig. 4). For this purpose fine silk impregnated with wax or paraffin is satisfactory. It is proper here, too, to caution against traumatism in handling the graft

and surrounding tissues. Too much respect cannot be shown to the tissues concerned.

Dressing—I am in the habit of putting a very thin smear of sterile vaseline over the graft. If too much is applied there is the possibility that a little will get under the graft. Then a small piece of rubber tissue is applied with a few perforations along the palpebral fissure to allow conjunctival secretion to escape. There should be no perforations over the graft itself. Gauze fluff is then carefully placed over the rubber tissue and

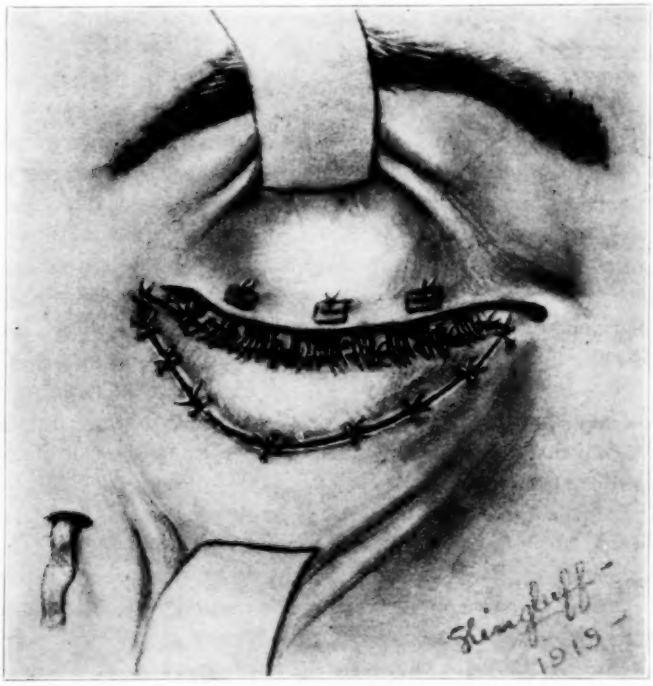


Fig. 4
Graft sutured in position. Area put on the stretch by adhesive strips. Wick drain has been introduced

packed in such a way as to fill in depressions and enable the surgeon to get firm even pressure on the graft. The gauze is secured by adhesive plaster. I like to cover the dressing entirely with strips of adhesive, putting them on like clapboards, and as snugly as possible. There seems to be no danger to the graft from too much pressure. Over this should be applied a *firm* bandage, and it is well to cover the fellow eye by a separate dressing that can be removed after two or three days of absolute

quiet. I cannot lay too much stress on *firm, evenly distributed pressure* on the graft from the dressing. For its life the graft is dependent on absolute contact with the underlying tissue, and parts that are not in contact will usually die. Ignorance of this idea has led to many failures in handling nonpedunculated grafts. Pressure will not interfere with capillary vascularization.

Before sewing up the wound occasioned by removal of the graft there should be free undermining of the skin, and relaxation sutures should be put in so that the margins of the skin flaps will be under complete relaxation, and marginal sutures should be put in to insure accurate apposition. "Dermal" suture

Fig. 5
Photograph taken a month after operation. Dotted line gives outline of graft. Adhesions supporting lower lid can be seen

material is satisfactory for both the relaxation and marginal sutures. The relaxation sutures can be omitted if the graft is taken from the upper lid.

The dressings should be left on for four days without disturbance. In cool weather it may be wise to leave them for five days. Sutures under tension should be removed at the first dressing. Others may be left a few days more. It is important that the graft should not be disturbed in any way at the first dressing. After very careful removal of secretion with small cotton sponges, rubber tissue and dressing are replaced and a

bandage applied with pressure. This may be removed again in two days and then dressings may be done daily.

It is well to keep rubber tissue over the graft for about two weeks. By this time usually the epithelium has been thrown off and the graft is perfectly secure. Massage with vaseline should then be started and continued daily until the grafted tissue is perfectly pliable, or until the adhesions between the lids are cut. These adhesions should be left for three months or more to insure complete correction. Usually they stretch out somewhat, but always they keep the lid supported, and when the fellow eye is open or in the attempt to use the eye on the operated side, the upward pull from the upper lid keeps the grafted tissue on the stretch and the lid in contact with the globe. Also the movements of the upper lid help to make the graft pliable. Little folds and creases develop in the graft which help to give a natural appearance. No permanent deformity results from the adhesions between the lid margins.

EPITHELIAL INLAY AND OUTLAY IN LID REPAIR.

COLONEL S. HANFORD MCKEE, C.M.G.; C.A.M.C.
MONTREAL
FORMERLY, OFFICER COMMANDING, WESTCLIFFE CANADIAN EYE & EAR HOSPITAL

Eye injuries in previous wars have formed only a small percentage of all wounds and while the proportion in the late war may not be much higher, Armageddon with its terrible face injuries has brought this subject very prominently before us. It has given us the opportunity for wonderful development in plastic surgery of the face and has forced upon us the necessity for studying the restoration of the orbit and eyelids and repair of the conjunctival sac, so that an artificial eye may be worn.

It is not my purpose in this paper to cover the subject of plastic surgery of the eyelids in so far as pedunculated skin flap and transplantation of cartilage are concerned, but to take up for a few minutes what I expect most of the members are now well acquainted with, namely, epidermic inlay, in its relation to the enlargement of the conjunctival sac, and secondly, epidermic outlay and its use in lid repair.

In the annals of *Surgery* for March, 1917, Esser has given us his "Studies in Plastic Surgery of the Face," and has described there in detail his method for enlargement of the conjunctival sac.

The difficulty met with in enlarging this cul-de-sac or rather in retaining an enlargement made, will be readily admitted by all. This difficulty has now been done away with and Esser, Gillies, Waldron, Risdon and others have given us a method as satisfactory in results as it is simple in procedure. Esser enlarged the conjunctival sac by means of a buried skin graft. An incision was made through the eyelid skin parallel to the palpebral fissure and extended laterally according to the extent of the conjunctival deficiency. The tissues were then undercut as close to the conjunctival sac as possible without perforating into the same, and an impression of the cavity thus formed taken with dental compound sterilized by boiling. The wound was then pared until the margins of the incision could be brought together without undue tension.

A thin Thiersch graft was then taken from the inner sur-

face of the upper arm and wrapped around the mould. The whole was then inserted into the cavity and the margins of the incision carefully sutured over it. In two weeks time an incision was made through the conjunctiva overlying the mould, which was then removed and the epithelialized area thus formed maintained by the immediate insertion of a temporary shell until an artificial eye could be fitted.

Waldron very materially modified and improved that technic by making the primary incision *in the conjunctival sac* instead of through the eyelid skin. The tissues were then undercut until a cavity somewhat larger than that desired was obtained. The dental compound was then made, covered by skin graft, buried, and held in place by suturing the cut margins of the conjunctiva.

Where it is found difficult to make an incision close to the tarsus and to do the necesary undercutting, an incision outwards and slightly downwards for 1 cm. from the external canthus is made. This permits easier eversion of the lid and renders the operative field more accessible.

WALDRON CLAIMS FOR HIS MODIFICATION

(1) Unnecessary scarring of the eyelids is prevented and the normal elasticity of the skin is not impaired. As it is not uncommon to have an accumulation of serum develop around the buried graft, sutures may give may, and slight infection may take place without impairing the success of the graft. These minor complications, however, in the case of inlays buried through an incision in the eyelid skin may lead to granulation and scarring, and in rare instances epithelialized fistulae have developed necessitating operative excision and closure.

(2) The exact position of the new fornix may be better outlined by an initial incision through the conjunctiva than by the undercutting to a point just beneath the surface of the conjunctiva. In our experience, the fornix may be made closer to the tarsal plate by incising through the conjunctiva.

(3) The depth and direction of the cavity can be readily determined according to the necessity of the individual case.

After cutting the conjunctiva and removing the compound in a few cases, I felt the suturing in of the compound so that the conjunctiva had to be cut to release it, was a mistake and a weak spot in the technic and I soon began leaving a space at the top so that while the compound and graft were still held properly in place, the former could be removed without any cutting. Risdon

has improved on this idea and keeps his graft over compound in place, by the pressure of the lids alone. So, to enlarge the upper or lower conjunctival cul-de-sac an incision is made above or below to the extent thought needed. Dental compound is moulded and fitted and a Thiersch graft is then buried and held in place for one week or ten days by the upper and lower lids alone or drawn together by a suture. At the end of ten days the lids are separated, the compound removed and an artificial eye inserted immediately.

Each case must be studied on its merits and where one variation may suit one case, it probably will not do at all in the next.

Fig. 1. Shows large epidermic inlay making a new cul-de-sac below

Naturally the size, shape, and position of the mould varies considerably. Where there is a general contraction of the socket, I, at one period, thought putting the graft in the *mid-line* a good idea. This I now think a mistake and feel sure the enlargement should be made either below or above. This will give a much better *cul-de-sac* for a glass eye than the general enlargement from a centrally inserted inlay.

Pte. D. Admitted to hospital with right eye enucleated, gonorrheal ophthalmia—socket very shallow—an incision was made along the whole floor of the cavity and an inlay over compound in-

serted. Three days later the compound had suppurated out. The graft took completely.

Pte. McI. Admitted to Hospital G. S. W., left eye enucleated, the left lid so adherent there was no cul-de-sac below. Under ether a large inlay was put in below. Five days later the stitches broke away and the compound suppurated out. In spite of this the graft remained and became a most satisfactory result. These two cases are cited to emphasize a very important point, that suppuration will not destroy your result.

Fig. 2. Shows centrally placed inlay.

Fig. 3. Glass eye in position.

Gillies, of the Queen's Hospital has given us two modifications of the Esser process. In the first, called by him epithelial outlay, the mould covered with graft is buried in the subcutaneous tissues through an incision in the skin and is removed through the same incision. The cavity opened is covered with skin. It is really the converse of the inlay. In cases of severe ectropion from wounds or burns this method will be found most excellent. The eyelid skin may be increased to the extent of the grafted area. In burn cases the skin needs to be increased particularly in the vertical direction. The line of the incision and amount of undercutting varies, of course with individual cases according to the degree of injury to be repaired. The incision is widened and

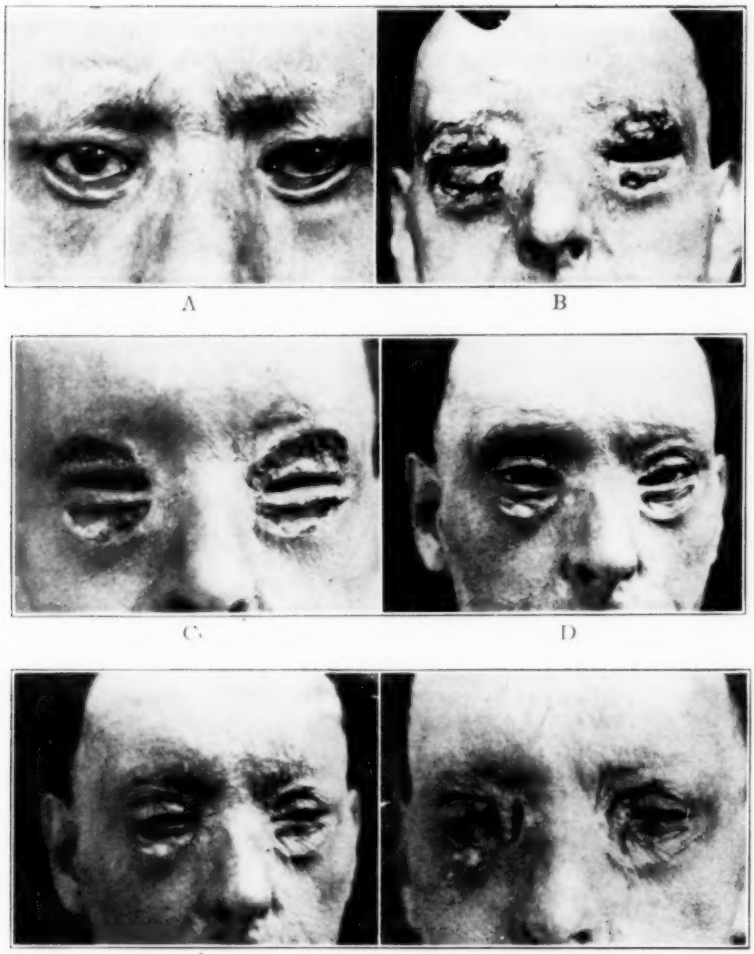


Fig. 4. The Restoration of the Eyelids by Epithelial Outlay. (Major Waldron's case.)

A. Condition before operation due to cordite burn.

B. Nine days after insertion of graft covered moulds. Sutures have been removed. The upper right mould is becoming ectruded.

C. After the incisions have been reopened and the impression compound moulds have been removed. The grafts have taken. The position of the original incision is seen.

D. Six weeks later. Good function—conjunctivitis cleared up. The increase in cutaneous tissue over the eyelids is as follows: (The inner canthus still displaced forward):

Right upper eyelid 2.5 x 1.2 cm. Right lower eyelid 2.5 x 1.2 cm. Left upper eyelid 2.5 x 1 cm. Left lower eyelid 3.2 x 2 cm.

E. Able to close eyes firmly.

F. Three weeks after further inlay operations for anterior displacements of inner canthus. Successful on left side. Grafts taken both sides.

deepened according to the amount of new tissue desired. Due care is taken to avoid injuring the levator palpebrae superioris.

After the dental compound is in position the ectropion is, of course, more marked than before.

The second method of Gillies' is termed epithelial overlay and is of great service where there has been extensive loss of tissue.

1. Ectropion. 2. Epidermic outlay.

3. Epidermic outlay. 4. Result.

Fig. 5
Major Waldron's case.

Here extensive undercutting may be necessary, before the remains of the eyelid can be brought to its normal position, and the covering in of a graft covered mould is impossible. In that case the remains of the eyelid may be sewn in a favorable position, the scars excised, and an impression taken of the entire raw area. A Thiersch graft is then applied to the raw area and held firmly

in place by means of the compound impression. This method will often do away with the necessity for pedunculated flaps.

I hope my remarks have been sufficient to give you some idea of what can be done in the repair of lids by epidermic inlay and outlay.

It is essential that the cavity be made much larger than thought necessary. It will undoubtedly shrink some. Suppuration will not destroy your result. After the compound is removed put in an artificial eye as soon as possible. This often has a beneficial effect on the hypersecretion sometimes present.

These methods are not a panacea, though they give results vastly superior to any previous ones, and offer much to ophthalmic surgeons. The results obtained in extensive ectropion following burns by the epidermic outlay technic of Gillies, are most satisfactory. Equally so are the results obtained by the epidermic inlay method of Waldron, in injured lids and in shallow and distorted conjunctival sacs. The development in Military Ophthalmology along these lines has been extensive indeed.

DISCUSSION OF DRS. WHEELER'S AND McKEE'S PAPERS

Dr. James Patton, Omaha: We are certainly indebted to Dr. Wheeler for this practical paper. We are all familiar with these cases of deformity, with the distress of the patient under the deformity and the distress of the oculist in his attempt to correct it, so this is helpful to us all.

The question of the type of graft and the type of flap to be used has been under discussion for years. Ever since the earliest work, the question of the thickness of the graft and its location has been discussed. It has seemed to us the type of graft depended on the degree of cicatrix. If thick, then the thick graft is necessary, but if it is comparatively thin and can be dissected away without too much destruction of tissue, we use the Thiersch type of graft, and in these cases we are able to get a satisfactory cosmetic effect.

Dr. Wheeler speaks in his paper of the location of the graft and that taking it from the temple has a decided advantage. You all know how the grafts from other portions of the body, the arm and leg, are slow to acquire the external local appearance, and if it can be taken from adjacent structures, it is easy to see how it would do away with this difficulty.

As to the technic of closing the lids, if the cicatrix is not too heavy, it has been our custom to draw the lower lid up over the upper lid and attach it by sutures to the surface of the upper lid just below the brow. You get the complete exposure of your field and at the same time do away with the necessity of a second operation.

The doctor in his operations has used the so-called autograft. I believe that until more work has been done along the line of determining the acceptability of the host to an isograft we are safer in adhering to the autograft, especially around the lids where so much depends upon the prompt and accurate taking. We have had some late reports where the isograft did take well, but at the same time, where you are working about the lids, I think the autograft is the safest.

DR. HUNTER SCARLETT, Philadelphia: Although there are broad general rules governing repair of cicatricial tissue, whether it be of a contracted socket or distorted lid, every such condition presents problems peculiar to itself, requiring independent study and treatment. Thus can be determined which method of operation is best suited for each case. Some operators prefer a Wolfe graft, others pedicle flaps where possible, others Tiersch transplants; while in some instances a combination of two methods can be employed with success. Of course the position, extent and nature of the lesion must determine in a large measure the procedure to be chosen.

In most cases resulting from war injuries, two, three or even four operations have been necessary before the final results were obtained. Thus it was found that the method such as a pedicle flap, for instance, employed the first time, could be better supplemented by a Tiersch or Wolfe graft the second time.

An operator is naturally in favor of that operation from which he has obtained the most satisfactory results, but possibly in selected cases just as good results can be obtained from one method as another. There are, however, some conditions which seem to be particularly adapted to the epithelial or Esser inlay, which, from all accounts, has been the only new method along this line evolved from the recent war. I refer especially to those extensive burns about the lids, face and forehead resulting in such distorted cicatrices that they preclude any chance of using a pedicle flap. A well moulded piece of dental stent, wrapped with a sufficiently large epithelial graft from the inner side of the arm, then buried in an open tunnel with the lips of the incised cicatrix sutured over it will give satisfactory results. This method is particularly efficacious in cicatricial epicanthi or narrowing of the palpebral fissure from contraction of scars at either angle.

As there is no subcutaneous tissue to give body or support to this graft, it is advisable to cut it at least one-half again as large as the area to be supplied, to allow for the enormous after contraction.

The question of how long to allow these stents to stay in place, in most instances, answers itself. Usually from the third to the fifth day one or two stitches will have pulled out or cut through, and gradually others follow until the entire incision has opened itself up, and the stent may be picked out with a pair of forceps. Where possible, it is better to allow the stent to stay in place for six or seven days, when it will come out of itself.

Infection does not seem to play an important role in epithelial inlays, as they practically all adhere, and though a small amount of the graft may slough away, sufficient remains, especially if the piece employed has been large enough.

In contracted sockets this same method can be used with gratifying results. In this type of case, as in cicatricial ectropion, I believe most of our failures have resulted from operating too soon after injury, before the tissue has contracted to its maximum.

At U. S. A. General Hospital No. 11, Cape May, our procedure was as follows: A small incision, about a half inch in length was made along the outer edge of the orbit, either above or below the mid point, depending upon whether the upper or lower cul de sac was to be restored. A tunnel was then dissected beneath the skin as near as possible to the surface of the socket without puncturing it, and extending to the inner angle. A piece of dental stent covered with epithelial graft and inserted into the tunnel was allowed to remain for from six to ten days, when an incision cutting down on the stent from the inside, allowed its removal and left a cul de sac lined with epithelium. A conformer of dental stent, moulded

to fit the socket, was then inserted. This was removed daily if there was much discharge, otherwise every two days, and the cavity irrigated.

The subject of Wolfe grafts has been thoroughly covered by Dr. Wheeler, so I will not take your time in discussing this method.

In conclusion, the opposition to pedicle flaps has been due to the resulting scars. Our experience in France during the first two years of the war proved that in most cases of cicatricial ectropion this method was satisfactory, and disfiguring cicatrices were avoided by taking especial care to approximate with mattress sutures the edges of the wound from which the flap had been dissected. In many instances we were able to follow these cases for six months to a year, or even longer, and were surprised to see how soon the scar lost its unsightliness. The advantages of this method of course are the broad base and subcutaneous tissue from which the flap may be nourished until it has become adherent. If a flap is too thick it may be thinned later by removing a little of the subcutaneous tissue, which can be easily done under local anaesthesia, thus doing away with any objectionable appearance.

Dr. Lucien Howe, Buffalo: Only those who saw the wonderful work done at the station near Baltimore can appreciate the skill which these surgeons acquired. But I feel impelled to add a word of caution as to conclusions based on recent photographs. For example: I present now photographs which seem to show a brilliant success.

They represent a young woman with extensive ectropium apparently cured by a graft without pedicle. The graft measured over three inches long and was the largest piece, which up to the time had adhered. Two pictures were taken, one thirty-four days, the other fourteen weeks after the operation. Apparently the result is perfect but later reports have convinced me that so great contraction of the graft has taken place as to leave a very considerable amount of ectropium. We must make these flaps very large to allow for contraction of the skin. We have no right to judge the real result until at least a year or two later.

Dr. G. B. Jobson, Franklin, Pa.: Dr. Wheeler's description of lid grafting coincide with a method described by me in a paper, which was read before a meeting of the Pennsylvania State Medical Society in 1906. In this paper I mentioned a case of complete removal of an epitheliomatous lower lid, and its successful replacement with a large graft taken from the inner surface of the arm. To date there is no appreciable shrinkage of the artificial lid, and with the exception of an absence of lashes, it resembles the lower lid of the opposite eye.

The principal points to be observed are: complete removal of scar tissue; selection of the graft from a region in which the skin contains a minimum amount of fibrous tissue; and the size should be at least twice that of the area replaced, as it can be temporarily shrunk by immersing in warm saline solution to facilitate its approximation; and it should be firmly stitched in place, with fine silk worm gut or silk sutures. I favor an impalpable boracic acid powder dusted on, and dry sterile gauze as a dressing.

Dr. Wheeler (closing discussion): In closing I wish to make it clear that excepting in severe burn cases of the face, true skin gives a better cosmetic effect than epidermis. The use of epidermis for lining the cul de sac may be preferable to true skin, but for surfaces that can be seen true skin should be used for good cosmetic result.

I should like to reiterate in regard to the care necessary in handling the tissue. I believe that traumatism should be avoided both in handling the tissue to be grafted upon, and in handling the tissue to be grafted. The fact should be borne in mind that mutilation leads to death.

With regard to the after care, I think rubber tissue is a satisfactory covering and do not see how it can be improved upon. A thin smear of vaseline should be put on and over this rubber tissue, which should have a series of perforations in front of the palpebral fissure. Rubber tissue should be kept over the graft until the epithelium has peeled off, and this usually takes about two weeks. Before cutting the little adhesions between the lids, it is well to inject novocain, because in a period of three months nerve invasion has taken place and cutting hurts the patient unless the adhesions are anesthetized.

Dr. McKee (closing discussion): There is no question about the point Dr. Howe has raised, that you do get contraction, especially in the inlay cases. However, the only poor results I have had are those where the inlay has been too small. The only thing to be feared is making them too small. Make them rather too large. In these cases sometimes we get hypersecretion, which is a great nuisance and very troublesome and hard to quiet. I think that putting in the glass eye as soon as possible is a good thing, but I have sometimes thought that it was an irritant, and lately I have tried to keep the cavity dilated with vaselined gauze. I have never been as careful with the graft as Dr. Wheeler has been and have not found it necessary. And unlike Dr. Wheeler, too, I believe in more or less irritating the tissue after the primary incision to get the bleeding you are going to have over with before inserting the graft.

PRESENT STATUS OF PLASTIC SURGERY ABOUT THE EAR, FACE AND NECK.

Jos. C. Beck, M. D.
CHICAGO, ILL.

Division;

1. As results of war injuries.
2. In civil life.

    a. From diseases.
    b. Injuries.
    c. Congenital.
    d. Cosmetic.
    e. Psychic or imaginary.

PLASTICS IN WAR INJURIES

1. Owing to the results from severe wounds and diseases of so many men in the World's War, there was and is a great demand for physicians and surgeons to correct and reconstruct these defects. Cases requiring plastic surgery about the head, face and neck make up a very large portion, although the proportion of Americans is small compared to those of the other nations who were in the fight since 1914 and 1915.

During the years of 1915 and '16 and '17 I presented papers before the Chicago Odontographic Society, Illinois Dental, Chicago Oto-Laryngologic Society, the American Academy of Ophthalmology and Oto-Laryngology, Dominion Medical Association and Alabama State Association in which I urged Oto-Laryngologists, Ophthalmologists and Oral Surgeons of America to turn their attention to the training for plastic surgery in order that when the time came (I was certain it would come) they would be ready to do their part.

In 1917, when United States entered the War, the Surgeon General in his organization of the Division of the Head, made provision for a department of Plastic and Oral Surgery under the command of Dr. Vilray P. Blair of St. Louis. He very ably and rapidly developed a school and classes for the education of men who would be employed in the service along these lines. I had the great pleasure and privilege of teaching in some of these

classes what I knew of reconstructive work from my previous experience in civil life, as well as from reading, and personal communication with English, French, Italian, Austrian and German surgeons as to their experience in war plastics since 1914. In these cases I was struck by the absence of men from the oto-laryngologic field, for I expected and hoped, they would be the first to enter this service. When I was asked by the department at Washington to recommend some men whom I knew and thought would like this special assignment, I received some of the most uncomplimentary replies, as well as poor excuses why they could not serve. I mention this fact advisedly at the present time, because it seems as though only that type of Plastic Surgery which has to do with Cosmetics or beautifying as, for instance, taking off of a hump or filling up a saddle defect of the nose, and which really calls for very little surgical skill, appears to interest some oto-laryngologists.

There are two periods during which plastic work is performed, namely, immediately after injury and secondarily or later. In the immediate operations, one attempts to bring the parts together as nearly normally as possible, both from the cosmetic side as well as functionally. This is very frequently not feasible by virtue of the fact that the patient's general condition will not permit operating upon him, or the tissues locally are not fit for operation, as f. i., foreign bodies, infections, lack of circulation, etc. In such cases one will frequently defer the work for a secondary operation. Secondary operations are also performed to improve previously corrected parts. This is rather the rule and it is not uncommon to have a case in which as many as fifteen operations are performed before a satisfactory physiologic and cosmetic result is obtained.

In the discussion of the various forms of war injuries about the head, face and neck requiring plastic surgery, it is not possible to classify them on account of their multiplicity of conditions, consequently no specific rules can be made as to their management; in other words, every case is a law unto itself. The degree of the injury, the condition of the tissues, locally, and the general condition of the patient, are of importance as to the result that may be expected.

In my own service at the American Red Cross Hospital No. 113, at Cognac, France, and Czecho-Slovak Red Cross Hospital at Prague, Bohemia, where I had charge of general as well as special work, there came under my care 326 cases of Plastic

Surgery of which 89 cases were of head, face and neck injuries. These were divided into—

1. Scalp and skull plastics, including upper part of orbit and upper eyelid.

2. External nose, including lower eyelid or upper lip.

3. Upper maxilla including external nose, upper lip or lower eyelid.

4. Inferior maxilla, including lower lip.

5. Both upper and lower maxillae including one or both lips.

6. Lower maxilla and neck wound with or without perforation of the larynx, trachea or esophagus.

7. Neck wound with or without perforation of the larynx, trachea or esophagus.

8. External ear.

9. Compound in which more than one of the above mentioned injuries were present.

These divisions could be further subdivided as f. i. Severance of large blood vessels and nerves, etc., but for a simple classification and easy indexing the above division served me very well, and in my observation of other surgeons' services, I found that this same classification would have answered the practical purpose.

The immediate result from operations on these cases in my service was far from satisfactory, because they were or had become infected, and practically every case demanded one or more secondary operations. The same was true in my observation of other work. It is very regrettable that in my service as well as that of many other men, the results of the secondary operations could not be followed up, owing to the fact that the patients were transferred to their respective homes, for further observation or operations.

There were, however, many places where I had the pleasure of observing cases that had been operated upon all the way from one day to four and one-half years before, as well as seeing different operators and many operations, so that I have formed a fair opinion as to results and selection of operations. While there has not developed anything remarkable or particularly new in Plastic Surgery in this war, there can be no question that much was learned from the large amount of material which the war furnished. I shall not attempt to go into great detail in describing operations, but will illustrate some of the work I have observed and make comments thereon.

Owing to the peculiar service that I had, I was enabled to visit many military hospitals in the Allied countries, particularly in France, Italy and England and, therefore, had a great opportunity of seeing the good as well as the bad. I have selected some of the procedures and have taken the liberty of illustrating them, not with any idea of publishing other men's work ahead of their original articles, nor that anyone, especially those not familiar with plastic work, shall be able to perform such operations,

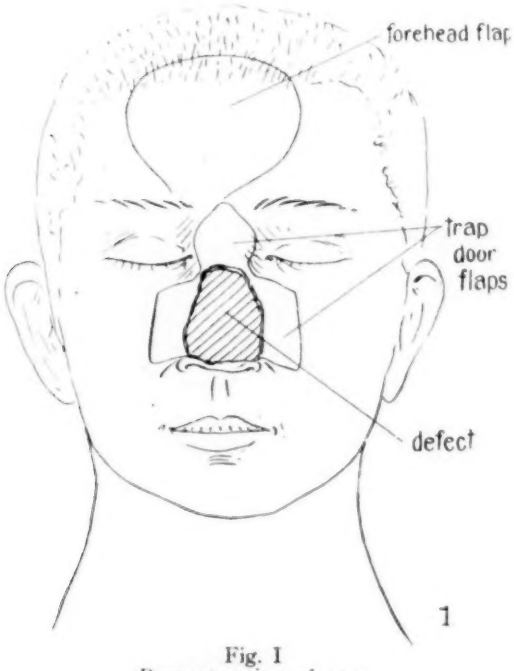


Fig. I
Reconstruction of nose
(English)

but merely to report some of the interesting work I have seen over there.

Fig. I. Nasal Defects: The following four illustrations show steps of an operation that appeared to give better results than any other, when the defect was confined to the lower portion of the nose. I had the pleasure of seeing cases operated upon by this method as presented in London to the British Medical Association as well as at Sidcop, Queens' Hospital, Canadian Division, under the head of Dr. Waldron. The work done at

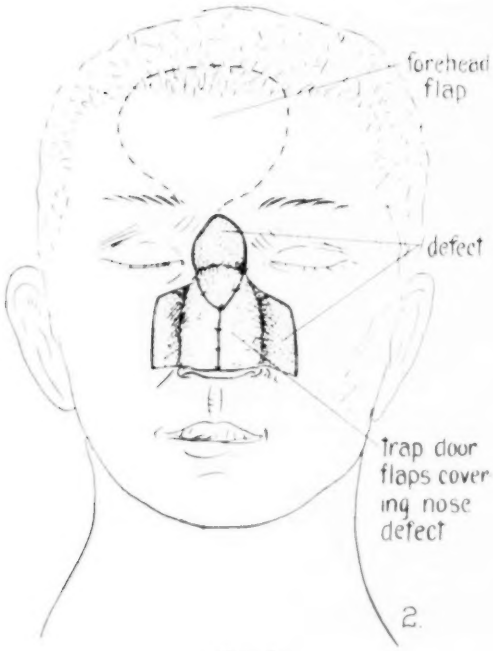

forehead
flap
defect
trap door
flaps cover
ing nose
defect
2.

Fig. I

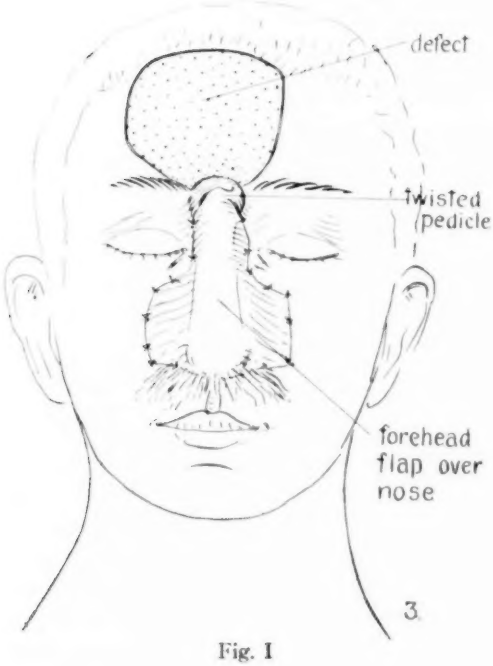

defect
twisted
pedicle
forehead
flap over
nose
3.

Fig. I

that hospital under the direction of Dr. Gillis was excellent and his publication (Text-Book) should be seen by all who are interested in the subject.

Fig II. Nasal Defects: The following three illustrations show particularly Le Maitre's operative procedures as carried out at the Hospital at Vichy, and he prefers it to any other procedure in defects particularly suitable for it. At times there is planted a piece of bone or cartilage under the forehead flap

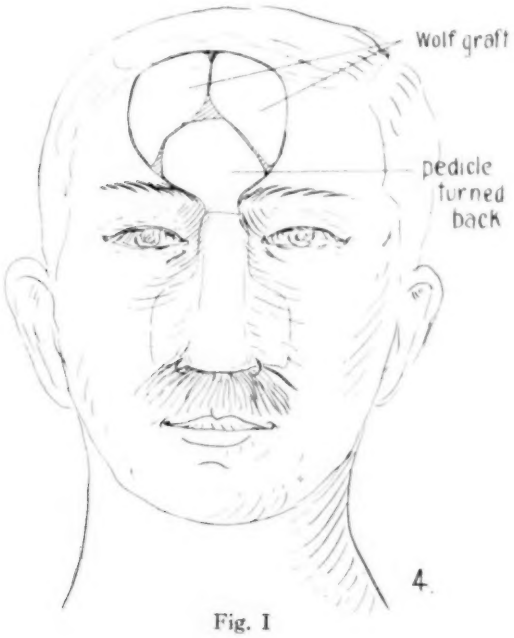


Fig. I

several weeks before the latter is transplanted. One very interesting point in Le Maitre's operation, is the fact that it is a one-step procedure. There are many other important and interesting facts about this and many other of his operations that would be of worth to describe here, but this is not the purpose of my paper. Consequently the writer would suggest the careful reading of Le Maitre's plastic work, which is to appear very soon in the Annals of Otology, Rhinology and Laryngology, St. Louis.

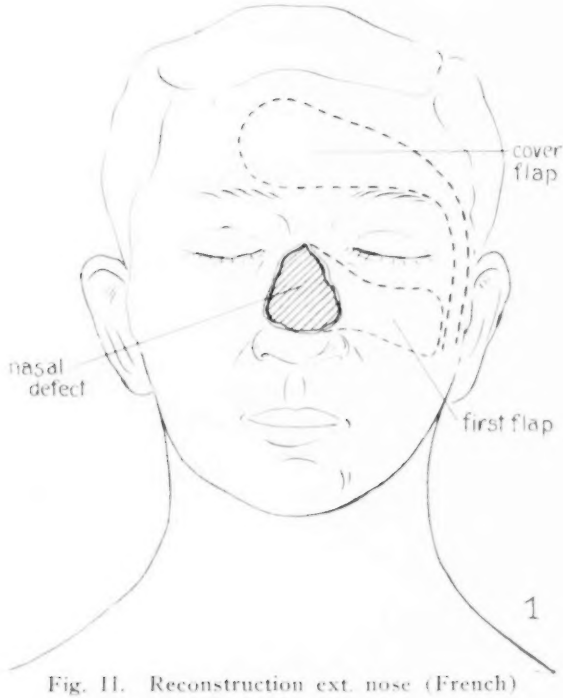


Fig. II. Reconstruction ext. nose (French)

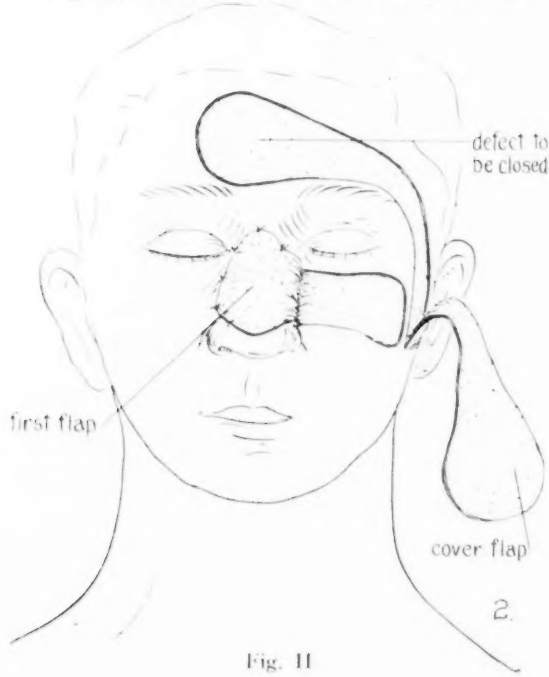


Fig. II

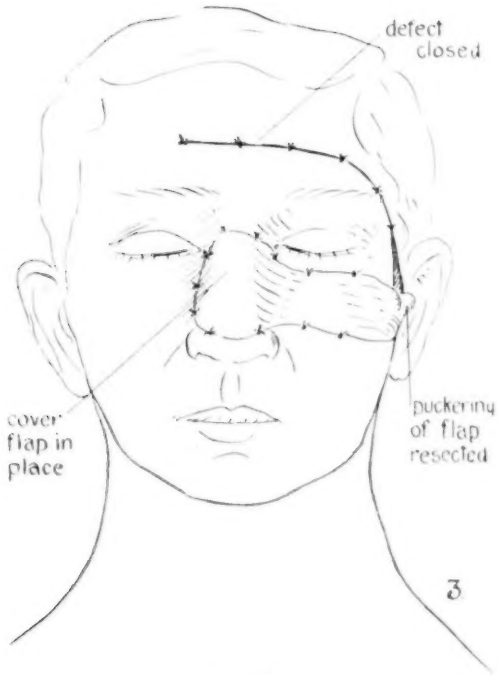


Fig. II

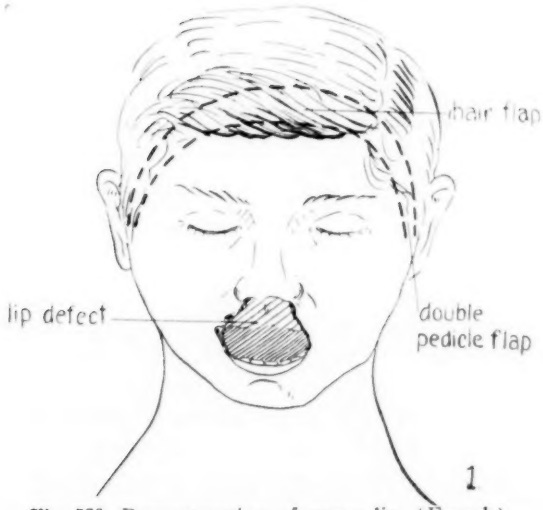


Fig. III Reconstruction of upper lip (French)

Fig. III. Upper Lip Defects: The following three illustrations show a very novel and satisfactory procedure employed by

Fig. III

Fig. III

Sibelo and his associates at the Val de Gras Hospital, in Paris. Of course, it is only applicable to males.

Fig. IV. Lower Jaw and Lip Defect: The following three illustrations show how easily very large double pedicle skin flaps can be taken from the neck without any great amount of scar formation resulting, or functional disturbances. It enables one to do subsequent bone implantation for lower mandible reconstruction. Both the English and the French make use of similar

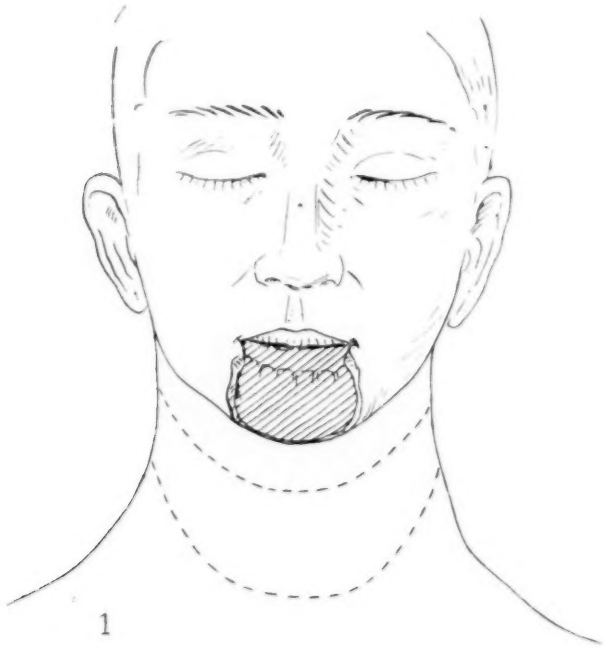


Fig. IV
Reconstruction of lower lip
(French and English)

technic. The operations on the lower jaw as suggested by Cole are perhaps the best that were done anywhere in the world. The pedicle graft appears to be more favored than transplant. Le Maitre lays much stress on regeneration of the periosteum in obtaining a solid jaw, whereas the English, Italians and Americans do not take much stock in it.

Fig. IV

Fig. IV

Fig. V. Lower Jaw and Lip Defect: The following three illustrations show a very novel method of reconstruction and I believe offer a much better ultimate result than just shown. The rolled-up mass of skin, etc., is left hanging by its pedicle for several weeks, being placed into the defect during the day, aiding speaking and eating. It is held in place by a bandage when it is sutured in place. I have seen a number of these cases in Prague, and also in Paris.

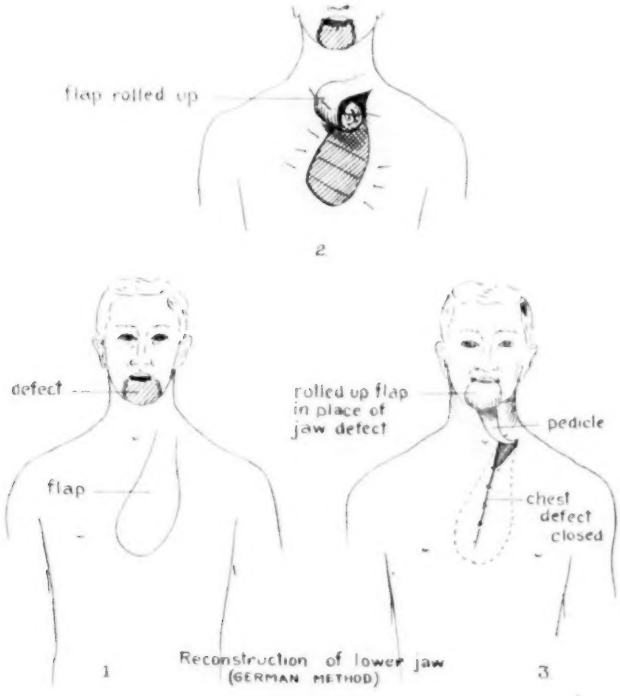
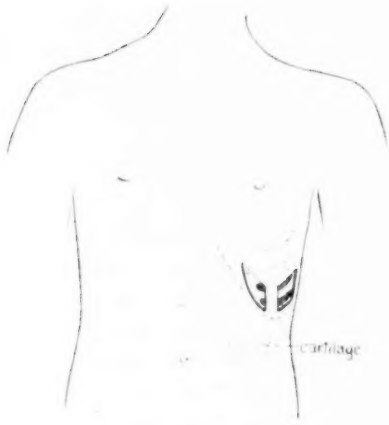


Fig. V

Fig. VI and VII. Bone and Cartilage Transplants: In order to stiffen parts in reconstruction of nose, jaws, etc., the English have employed the crest of the illium in preference to the anterior border of the tibia (Rysdon said that they had several cases of fractures of the tibia following removal of the parts of same). My idea is that it was probably due to a secondary rarifying osteitis, causing the fracture rather than that too much was removed. In the use of cartilage transplants a very practical and

Operation for reconstruction of the lower jaw (ENGLISH)

Fig. VI



Cartilage Storage (ENGLISH)

Fig. VII

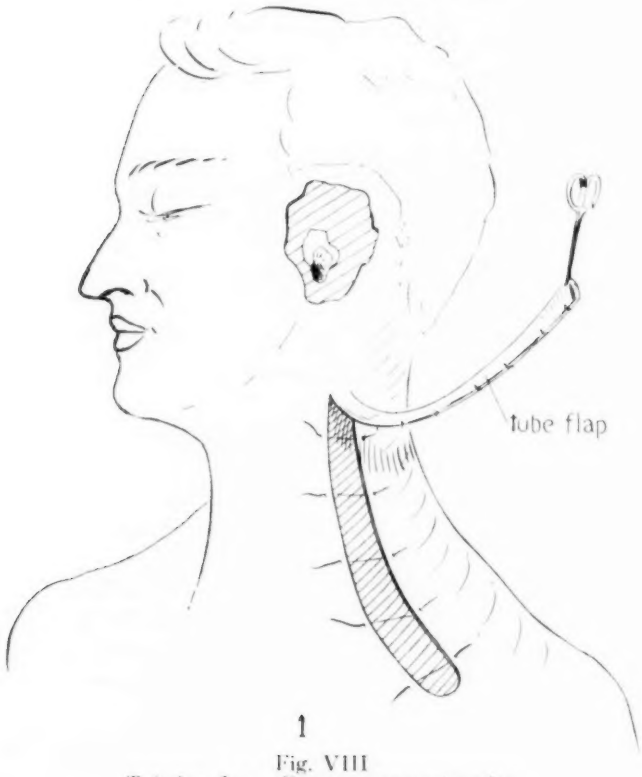


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Fig. VIII
Tubular flap. Ext. ear reconstruction (English)

novel idea is the resection of several pieces of costal cartilage but only perhaps making use of one piece. The remaining pieces are placed right under the true layer of skin in close proximity to the incision which is closed. Then whenever another piece of cartilage is required in the same or another case, one can very easily open the incision under local anesthesia and remove a piece from the storage place.

Fig. VIII. The following two illustrations show a very

2

Fig. VIII

practical flap for external ear construction employed by the English. The neck flap is doubled up upon itself along its length with the skin outwards and the end sutured into the ear defect: subsequently the pedicle is cut and this tube like flap is shaped into an auricle.

There are a number of other procedures that have been developed, which are of interest especially in maxillo-facial plastics. I have reference to the various appliances, but there too

each case requires its particular constructed apparatus. In this connection, Le Maitre's work shop was the best I ever saw; it demonstrated the importance of the association of a dentist, mechanician and plastic surgeon.

One striking feature to me was the rarity with which the Italian operation was performed. Only in Italy have I seen cases operated by that method and very few at that. On the other hand, considerable use of Wolf and Thiersch grafts was being made. The keeping in position of these grafts by the modeling compound (stent) in the orbital and oral cavities give good results. The open wound dressing was another departure and less infection, of milder character, was noticeable in consequence.

One of the most important factors in the successful outcome of plastic operations, is not to operate too soon after the primary or previously performed secondary operation. This fact was thoroughly exemplified over there in that the intermediary waiting period was usually from three to six months. In civil life it is most difficult to put off patients who are constantly urging to have the work finished. Operating too early after a previous operation has caused several defeats in my practice.

In regard to my observation in plastic work in American hospitals abroad I am not able to say very much, simply because there were not many cases and too early to judge.

At the American Red Cross Hospital No. 1, at Nuille, France, I saw about two hundred maxillo-facial and other head plastics in charge of Dr. Coughland making use of methods entirely individual.

Considerable stress was laid upon the use of the Carrel-Dakin solution and the bacterial control before operation was undertaken.

At the Base Hospital No 115, at Vichy, I was disappointed not to find any face, head or jaw plastics, only a few lid cases in charge of Dr. Francis. In this country I have seen recently some of the cases that were sent back for further work at Jefferson Barracks, Ft. McHenry and Walter Reed.

Dr. Blair, who was in charge at Jefferson Barracks, was kind enough to show me some of his cases as well as operate a most difficult case. His development of the technic in that particular case the day before operation, exemplified one of the characteristics of a good plastic surgeon, namely patience. Casts, photographs and artistic illustrations were shown in abundance and should be of considerable value when published.

Dr. Shaeffer at Ft. McHenry was equally desirous of show-

ing me all he had and I should say his operating technic, cases, demonstrations, as well as their records, casts, models, photographs, etc., would stand criticism as good work.

Dr. Ivy, in charge at Walter Reed, had the advantage of the previous two gentlemen, in that the equipment, artists, etc., appeared to be of a higher standard and therefore he could demonstrate to better advantage. Some of the most interesting cases were shown to me and an operation on the lower jaw was performed in the classical Cole method of a pedicle graft. Particularly valuable was my observation in the Dental Mechanics laboratory, where the various appliances were made by what appeared experts, and reminded me of Le Maitre's work shop.

The results from the surgical standpoint, I believe, can not be improved upon, but cosmetically and functionally there is much to be wished for. This I say from my observations on cases which I have observed that have come under my care, at the Marine and Public Health Hospital in Chicago, for further operations. Most of these cases have never seen the three hospitals nor surgeons just mentioned, but were cases that were taken care of at regular base hospitals over there and sent back much earlier than these mentioned at Jefferson Barracks, McHenry and Walter Reed.

Finally there has developed this fact, that practically in no instance was a soldier willing to accept an artificial ear, nose, jaw or part of face instead of a reconstructed one by operation, though the prothesis was much better looking.

PLASTICS IN CIVIL LIFE

a. "Following Disease": Following diseases such as syphilis and tuberculosis are responsible for the largest number, but with the present mode of treatment by salvarsan in lues and radiotherapy in tuberculosis, there will be a marked decrease in their production. The treatment of scar formation as an end result of a healed out luetic nose gives the greatest difficulty in the healing of the parts after operation. It is therefore best to remove as much as possible of this scar tissue even though the defect is made greater by so doing. Although one considers the case cure of syphilis with a negative Wassermann for some time, I have found the giving of salvarsan at the time or just before the operation, to be of value in the healing of the parts.

There is one operation following the disease of atrophic rhinitis that I wish to describe very briefly, which is a plastic for therapeutic or physiologic purposes. I have already reported on

the use of fascia lata implantation for this purpose, but now I employ only septum, both cartilage and bone, obtained from a freshly submucous resected septum, just preceding the operation.

The technic is very simple. One performs a thorough dissection of mucoperiosteum and perichondrium as in an extensive submucous resection, then breaks through the cartilage and bone at several places. This is done for the purpose of permitting circulation between the two layers of perichondrium and periosteum, thus improving the nourishment of the implants. The just previously resected septum (having tested the blood for proper grouping of donor and recipient) is now cut into small pieces and put between the mucoperiosteal and perichondrium flaps, taking great care not to allow contact with the distention, at the inferior meatus. The incision is closed by a stitch and sealed with collodion.

Lupus or tuberculosis, which are much more rare, will cause deformities of the tip of the nose or the alae. Since the use of x-ray and radium treatment have replaced the surgical attacks, the subsequent plastic results are far more satisfactory, owing to less frequent recurrences of the disease.

Malignant growth particularly epithelial both of ears, external nasal, eye lids and lips make up quite a number of cases that require plastic operations subsequent to x-ray, radium or surgical intervention.

b. Traumatic. These have increased very much in the past few years due to automobile accidents, but on the other hand have decreased considerably from occupational causes. The latter is due to the fact that manufacturing plants are more careful in the fitting out of shops with safety devices and there are special Insurance Boards who look after these matters, in order to safeguard both employer, employe and insurance company. There is no possibility of classifying cases of injury which are the same as those occurring in war times and every case is a law unto itself. One type of traumatic deformity has interested me particularly, namely facial paralysis, and I shall describe same more in detail with report of some cases.

c. Congenital Defects. Three types of deformities have presented themselves to me more frequently than any other, and these are:

1. Total or partial loss of external ears.
2. Marked shortening or absence of colomella with absence of septal cartilage.
3. Cleft palate and harelip.

1. In the correction of the "*external ear*" I have now four

Fig. IX

Fig. IX

Fig. IX

Fig. IX

cases under treatment of reconstruction and will very briefly describe them, because, thus far, the subject has not received the attention that it should. The first illustration, Fig. IX, shows the cases before anything had been done. They are from 2½ years to 6 years of age. One is a bilateral case. X-ray of mastoid shows in each case the evidence of a middle ear and outline of the internal ear. Rotation test shows functioning vestibular apparatus in three, however, duration of nystagmus much reduced in deficient ear. Attempts made in the younger children as to the ability to hear by the aid of the noise apparatus was not successful because all these children refused to permit the buzzer in their ear. The oldest (girl 6 years) did permit it, and I found that she did not hear on the defective side, although there was a nystagmus on rotation present.

Fig. X

The second illustration, Fig X, shows the children after one or more operation, of adding tissue by pedicle flaps from the mastoid and neck regions. Cartilage transplants will be employed when the soft parts of this ear is finished, rather than immediately, because from my previous experiences when the shrinking began it crumbled the cartilage out of shape. I shall make use of costal cartilage from mother or father (depending upon the result of the titrating test of blood of donor as well as recipient of the tissue). In the past year I have made use of resected septum cartilage and bone of other patients proving up this above mentioned grouping by the blood test.

2. Congenital absence of part or all of the septal cartilage, causing the squashed tip of the nose with a very short colomella. This in turn causes the greatest diameter of the nostrils to be in the horizontal rather than the vertical meridian. The correction of this condition is very easy by taking a section of the rib which contains both bone and cartilage. The bony portion comes in contact with the floor of the nose at the rostrum, thus getting bony union.

3. *Cleft Palate and Harelip Operation.* This is such a very large subject that a paper taking full time limit would not be too much. I shall, however, confine my remarks to conclusion that I have arrived in the ultimate results of the cases that I have had.

1. The earlier that I had the infant to operate the better the results.

2. Always do both lip, hard and soft palate the same time, even though the hard palate may require another and another operation.

3. In bringing the premaxillae in apposition it is of great importance not to penetrate with all kinds of awls, needles and wires, this destroying the follicles, arresting the development of the jaw and loss of permanent incisor teeth.

4. Great effort is to be made to make both nostrils similar as well as avoiding dimpling or puckering of the lip at the mucocutaneous junction.

5. Most of my failures of nununion of soft and hard palate I believe were due to lack of freshening of margins of the cleft as well as not sufficient laxity of the dissected mucous membrane. In small perforations of the hard palate which have had several operations, having as a result considerable scarring I have succeeded in bringing down the inferior turbinated body and closing it.

d. Cosmetics: There are types of deformities or malformations about the head that are borderline cases, and should receive our most careful and expert attention. I have reference to congenital malformations as a large hump nose, saddle nose, extreme bulbous tip, extreme small or large nostrils, short upper lip, massive hanging lower lip, deformed ears, etc. Many of these patients have talents and opportunities in public or social life, but keep out of it on account of being sensitive or so handicapped as not to obtain positions which they otherwise would.

e. Psychic or Imaginary. This form of deformity or malformation is probably more frequently met with than medical men have any idea, simply because most of these unfortunate

mental cases fall into or are forced upon the "quack" beauty specialist. I mean they are forced upon them by the regular physician and surgeon who recognizing the patients to be neurotic or mental cases, refuses to operate upon them. These patients are the most difficult to handle, no matter from what standpoint considered. It is the duty of every physician and surgeon to try to argue with them, to convince them that correction is unnecessary. Only in a small minority will one succeed. It may be well for him to show the patient some of the bad results that have been obtained at the hands of the quack, such as paraffinomas, etc. In this connection I wish to call attention to a horrible case of paraf-

Fig. XI

finoma recently coming under my care and in which I believe I made a valuable discovery as to the treatment of this terrible condition.

Miss N. Apparently had nothing the matter with her nose; Fig. XI. Went to some doctor in Minneapolis requesting to have her nose operated for some imaginary deformity. He refused, so she followed the alluring advertisements of a Chicago Charlatan, beauty doctor, who injected her with paraffin. There resulted a typical paraffinoma, causing the girl mental and physical pain. Fig. XII shows how she looked In order to study the histologic and chemical change of the tissue, I excised a piece from the

Fig. XII

Fig. XIII

center where there is seen a scar, Fig. XIII. Leaving the cut surface covered only with a thin layer of gauze, I noticed that from the margins there was an outpouring of a thick whitish substance

Fig. XIV. Paraffinoma

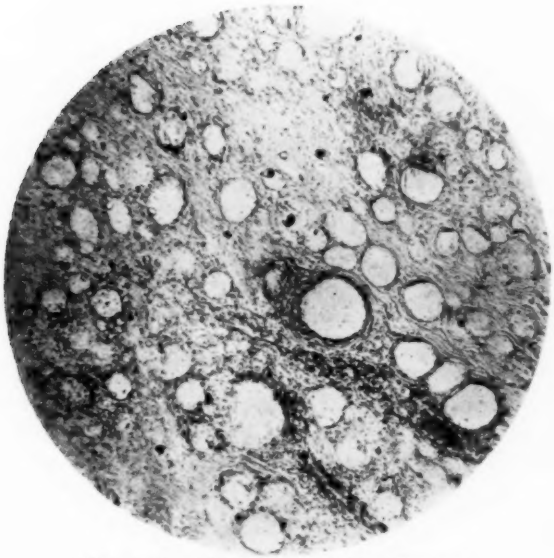

Fig. XV. (High Power) Paraffinoma

which proved to be paraffin, relieving the pain and making the tissues much softer. Whether the skin will recover so as to be able to do a minor operation or whether the entire nasal frame-

work will have to be decorticated as in Rhinophema, I am not able to say at this time.

While the open treatment to the paraffinoma was beneficial in that considerable amount of the paraffin escaped, it was such a slow process that I decided to operate upon her. Under general anaesthetic (local being impossible, owing to the great pain on even inserting the hypodermic needle) the skin about the nose not involved in the paraffinoma was dissected and the masses of the tumor resected, Fig. XIV, and subjected to microscopic examination, Fig. XV. The tip of the nose which contained very little paraffin was, however, much changed by a Rhinophemic ap-

Fig. XVI

pearance. The venules were much dilated and increased in number. To destroy them, I applied 25 mm. of radium by means of needles, which were left in for eight hours at two different periods. Fig. XVI shows the case as it appears now. Some time later I intend to do a rhinoplastic operation to cover the defect at the dorsum of the nose.

As to being satisfied with the cosmetic result it is practically unheard of, the patient asks for further correction even if it is ever so little. Recently there had come to me a case that is so important in the discussion of my subject that I will ask your indulgence to listen to what may be called idle gossip. Important

because of work done by two of our prominent oto-laryngologists and one general surgeon prominent in this line of work, who have allowed themselves to be coaxed into operating one of these poor rich creatures, to their detriment, the patient and science. Mrs. X, about 35 years of age, having one child, all the comforts of a home, decided that now the time has arrived when she must have something done to her nose, particularly the point must be more prominent. She actually shuns the society of her friends, being so conscious of her deformity. A photograph shown to me of her appearance at that time shows a well proportioned nose and face. Traveling very far she reaches the doctor with the reputation (for she will never consult a charlatan or advertising quack) who tells her that she does not need the operation and she leaves him satisfied and contented to leave well enough alone. The same day, however, the specialist has her notified that all is prepared for her operation for the next morning. Greatly surprised she declares that she will now abide by the doctor's advice not to be operated upon, whereupon the doctor telephones himself stating that she had better have it done for she will never rest until it is done. Going to the doctor's office she was operated under local anesthesia in a sitting posture. The doctor took something out of the inside of her nose and put it over the bridge, right under the skin. This caused a bad hump and she was much displeased as well as enraged at the enormous fee demanded. Returning back to her home she was much distracted over her appearance, consulted an oto-laryngologist who also did some work in this line. This gentleman resected a piece of rib which fractured into three parts causing an empyema for which she was twice operated. The transplant into the side of her nose (alae) made things much worse and she was now in a horrible condition (all these are exact expressions of patient as taken down by stenographer). In due time she had heard of another great man, this time general surgeon, who, according to medical publications, could help her, so she again travels far to have the real work done. She had also received information that in the vicinity of this general surgeon there were two other oto-laryngologists that had reputations as plastic surgeons, so she consulted them also; however, neither one of these would give her any satisfaction. Consequently she was operated upon by this general surgeon (specialist in plastics) who resected a piece of rib on the opposite side of chest and planted a strip over the bridge of the nose, through an external incision at the root of the nose. He really made a prominent tip and she thought now that she would

be satisfied. Alas, not so, the sides of the nose were now very unsightly and caused her whole facial expression to change to an abnormal one. Besides, this strip that the last doctor put in was so close under the skin at the tip as to make it red and painful. Also she fears it might push through.

This threatening ulceration of the transplant, caused her family physician to write to me about the case in detail and ask me to take charge. Knowing the type of these patients, I discouraged him to send her on such a great distance, but she appeared nevertheless. I found a highly cultured lady, absolutely normal in every way, mentally and physically, now very sorry as to what she had done and wishing she could have her nose as it was before anything had been done.

Examination showed the transplant protruding at the tip of the nose, being covered by a thin layer of epithelium and surrounded by a red and painful area. I condescended to remove the transplant and at the same time implant some fat in the tip of the nose, to prevent subsequent shrinkage. This was accomplished without any difficulty by making a small incision in the colomella, that left no visible scar. The patient left very much happier than she came, the operation having prevented an ulceration with possible secondary infection and a disastrous result. That the patient will not be satisfied with the cosmetic result, there is not much doubt in my mind, but the lesson she has learned should be a warning to others wanting such work done, and to the surgeon condescending to perform such operation. As stated before there is a very sharp line of differentiation between real cosmetic cases and such as these last two illustrated.

DISCUSSION

Dr. George W. Stimson, of Pittsburgh: It was my good fortune in March to be ordered to Paris for three weeks to see their reconstructive surgery of the head. Certainly marvelous work was being done there by the French, and particularly by Le Maitre. In speaking of grafts from the forehead in reconstruction of the nose, many patients were observed who had a vertical ridge in the middle of the forehead, which was freely movable beneath the skin. This was an osteo-periosteal graft from the tibia, which had been previously inserted through a small incision and permitted to remain for two or three months while minor reparative work was done. Then the flap from the forehead with the osteo-periosteal graft included was brought down. By this means the circulation and vitality of the bone in the flap was firmly established, and brought to the mid-line it formed the bridge of the new nose.

Dr. Seymour Oppenheimer, New York: These are times of reconstruction, not only of governments and economic conditions, but of faces. Very interesting work has been done, as we all know from exhibits, illus-

trated articles and even novels, with the aim of making the war-scarred soldier not only presentable but even handsome.

He is provided with a new nose or a new upper lip as required, and special pains are taken to make his new nose shapely and to take the graft for his upper lip from the top of his head, so that he may not be deprived of the ornament of a moustache.

Inevitably our thoughts revert to a few years ago, before the war, when cosmetic surgery was considered rather a shady business. Physicians were then decidedly chary of doing operative work for purely cosmetic reasons. Although besieged by men and women who felt that their happiness in life depended upon the alteration of some offending feature, they discouraged them or even refused point blank to operate, with the result that quack institutions throve on the treatment of facial defects. Such institutions have been known to approach a surgeon of good standing and offer him large sums of money to operate anonymously on patients furnished by them, probably not realizing that if he so desired he might spend his entire time performing the same operation on patients coming to him direct.

Possibly on account of the disrepute in which surgery for cosmetic purposes was held before the war, its methods were shrouded in mystery and its procedures were fraught with tremendous difficulties. Fortunately the publicity connected with the recent reconstruction work has changed all this. The mystery has vanished, and the tremendous difficulties so much talked about proved practically nonexistent.

Apropos of the latter, let us take an example from civil life and suppose that a woman with a large nose of the Hebraic type comes to have a hump removed from the offending feature. This is not a difficult thing to do—not near so difficult as building a war-shattered nose. Any man who can remove cartilage from the nose submucously can go a little further and scrape a hump off of it. Moreover, we make bold to affirm that when the hump is off no harm is done. On the contrary, the woman is happy, the rhinolaryngologist is happy, and presumably the people at large are happy that an ugly nose has been replaced by a handsome one.

It is our hope that the influence of the facial reconstruction work of war which has banished the mystery and odium of cosmetic surgery and its methods, will be sufficiently far reaching to give the civil population in peace times the same benefit enjoyed by the soldier in time of war. Cosmetic surgery, we feel, should at this auspicious moment be taken once for all out of the hands of charletans and quacks and given a legitimate status in the profession.

Dr. T. E. Carmody, Denver, Colo.: I think we are indebted to Dr. Beck for the paper at this time, as those of us who have been in the service have not all had an opportunity to see this done. I have been interested in this work a long time and have profited by the publication of books and talks with people who have been able to do this work. Some of the work shown I have found of value in the last few months. The stump introduced by Wheeler has given good results. The paraffin cases have consulted some quack who has gotten bad results which we have had to correct. While I agree to a certain extent, I see the point just made that we allow these cases to drift away from us by not doing a certain amount of the work through fear of getting bad results. We should not allow these cases to get paraffin.

Dr. I. W. Voorhees, New York: Referring to Dr. Beck's remarks about this work being relegated to the quacks because no reputable surgeon seems to have thought it worth while to become proficient in it until the war forced some action upon the profession, I have had experiences which bear Dr. Beck out.

Recently I saw a case which had been treated with paraffin by a quack with rather disastrous results. A servant girl having a depressed external nose of minor degree went down town to buy a dress. She could not find just what she wanted, so having money in hand decided to spend it on her nose instead. The quack injected paraffin not only into the depression between cartilage and bone, but also into the nasal septum, and she came five days later to the Manhattan Eye, Ear and Throat Hospital with a well-developed septal abscess.

The house surgeon opened the abscess twice by a small incision and got some paraffin each time, but swelling and great nasal obstruction continued. I then opened the abscess by a wide vertical incision as in the submucous operation, and cut the left flap along the floor with scissors The cavity was then curetted free of detritus, washed out, cauterized with carbolic and alcohol, and the flaps were apposed by Bernay splints. Healing was complete in two days but she has more deformity than she had before her unpleasant experience. Nevertheless, she insists upon our doing a bone transplantation, but we have advised against it, at least for the present. We may do something of the sort later on.

Dr. Beck (closing discussion): Let me make myself clear on one point. Fourteen years ago in Pittsburgh before the Triological Society I made the point that the people were getting unskilled men to make these corrections, many times imaginary defects, and the society should take it up and discuss it. Dr. Goldstein was the only man who had the courage to say he would take this up and study it. I do not mean for slight imaginary defects. When we have to remove what the other fellow has put in it is an emergency operation. This woman I showed begged me to put her where she was in the first place. But I do not mean the so-called psychical cases. I did not mention something I have in my paper, that great credit is due these men who have worked this out. I see cases now in the Chicago Hospital that is concerned with public welfare, where these men come back now discharged and have to have this work done. So many cases are not completed and now comes the work of final plastic surgery of a cosmetic character.

A REPORT OF ELEVEN CASES OF CERVICAL SYMPATHETIC INJURY, CAUSING THE CLAUDE BERNARD-HORNER SYNDROME.

HUNTER SCARLETT, M. D.,
PHILADELPHIA, PA.,
AND
STANLEY COBB, M. D.,
BOSTON, MASS.

The report of the following series of cervical sympathetic lesions, due to G. S. W., observed in the U. S. A. General Hospital No. 11, was prompted by the comparatively large number coming under our care at one time, and by the relatively few cases noted in military literature to date. That more such cases have not been recorded during the present war, may be due first to the fact that in the stress of work they were overlooked; secondly, because of their slightly defined symptoms, and lastly, it is possible that no evidence of a Claude Bernard-Horner syndrome appeared until some weeks or months after injury, the patients by that time having passed from under medical supervision. Our cases, on the other hand had, in some instances, been wounded six to nine months before admission to the hospital, and sufficient time had elapsed for symptoms to develop.

Heretofore the majority of sympathetic paralyses has occurred in civil life, and has been due to causes other than traumatic, such as cervical rib, aneurysm, enlarged glands, mediastinal tumors, etc.; although some have been due to injuries, and a few have been recorded in times of war. The earliest data we have on this subject, especially from the standpoint of ocular symptoms, dates back to 1727, when Pourtour du Petit[1] made his experiments on the cervical sympathetic nerve. In 1851, Budge[2] localized the center for the pupillodilator fibres between the sixth cervical and the fourth dorsal vertebrae. Claude Bernard[3] in 1858, working on animals, observed the ocular phenomena resulting from stimulation and section of the cervical sympathetic, while Horner, in 1861, published the first clinical case of paralysis of this nerve. Mitchell, Moorehouse and Keene[5], in charge of the nervous wards of the U. S. A. Hospital, Turner's Lane, Philadelphia, during the Civil War, gave the first accurate account of a gun shot wound of the sympathetic. Mr. Paget[6] in 1865,

referred to this condition in connection with injuries to the brachial plexus.

Coming down to the present, Roche[7] reported four cases in 1916, and collected seven others, while Burger[8] recorded one in 1917, and Tournay[9] one in 1918. Our series of eleven cases was picked out of 530 cases of peripheral nerve and spinal cord injury.

It is interesting to compare the prominence of symptoms in different patients, and the completeness or incompleteness of the ocular sympathetic syndrome. This may be due, according to Bernard[10], to the fact that the center for oculopupillary action is situated at the eighth cervical and first dorsal vertebrae, while the centers for vasomotor, secretory and trophic changes are located at the second to sixth dorsal vertebrae. A lesion may thus involve one without affecting the others. In this connection, he demonstrated by experiments on dogs, that section of the first dorsal root produced oculopupillary symptoms, while section below this point of second to fourth roots, caused only vasomotor changes.

Oppenheim[11] demonstrated in a gunshot wound of the neck, where the first dorsal segment was exposed, that by stimulating the anterior roots oculopupillary symptoms were produced; but none occurred on stimulating roots below the first dorsal.

Krause[12] thinks there are only oculopupillary symptoms if the spinal cord is affected, while there are vasomotor symptoms if the rami communicantes are principally involved. On the other hand, Mme. Dejerine Klumpke[13] experimenting on dogs in 1885, demonstrated oculopupillary phenomena only when rami communicantes of the first dorsal nerve were affected.

It is not our purpose in this report, to attempt to localize the pupillary, vasomotor, or trophic fibres, but to present the cases in order of prominence of their ocular symptoms, and then to discuss them briefly from the standpoint of their neurologic diagnoses.

Before doing this, however, a resumé of the anatomy and physiology of the cervical sympathetic might be of assistance.

ANATOMY AND PHYSIOLOGY

The dilators and sphincters of the iris are too well known to need description, but the exact anatomy of the involuntary muscles of the orbits is still unsettled. In general these muscles may be described as follows:

Behind the eyeball smooth muscle fibres occur in the periosteum and form a strong layer closing the orbital fissures. This

is the musculus orbitalis which prevents the contents of the orbit from sinking backwards. In the tendons of the levator palpebrae superioris there are also smooth muscle fibres, and closely related to these are the tarsal muscles, small masses of involuntary muscle which lie at the bases of the upper and lower lids and insert into the tarsi. All of these, through their tonic activity, tend to keep the palpebral fissure widely open.[14]

The innervation of the pupil is double, the mid-brain autonomic system sending fibres to the sphincter iridis, and the cervical sympathetic supply the dilator. The orbital and tarsal muscles, and the nonstriated part of the levator palpebrae superioris are supplied only by the sympathetic system.

The spinal center for these sympathetic nerves lies in the lateral horn of the eighth cervical and first and second thoracic segments. Closely associated with this center are the cells of origin of the fibres which control the sweating and vasomotor reactions of the face. Some authors consider that these latter functions have their centers lower down the cord, in the second to fourth thoracic segments.[15]

From these centers in the cord preganglionic fibres arise and pass via the corresponding cervical nerves and rami communicantes to the cervical sympathetic chain, finally terminating in the superior cervical ganglion.

Superimposed on the spinal center there is doubtless a cortical control, for such highly integrated reactions as fear and pleasure have their oculopupillary and vasomotor concomitants. Also a bulbar center may be postulated, since lesions high in the cervical cord may cause myosis.

The peripheral nerves (in this case postganglionic sympathetic fibres) arise from cells in the superior cervical ganglion. These fibres at first are collected in the internal carotid plexus, but soon take separate courses. The more inferior branches probably spread out to supply the sweat glands and blood vessels of the face. The more superior generally follow the ophthalmic branch of the trigeminal nerve, and pass with the vasociliary nerve into the ciliary ganglion, from which they emerge and proceed with the long and short ciliary nerves to their endings in the smooth muscle fibres.

Physiologically it must be kept in mind that the action of these nerves is tonic. In the case of pupil there is a balance of two antagonistic systems, the autonomic sphincter and the sympathetic dilator; so the autonomic is allowed to act without restraint and cause continuous myosis if the sympathetic innervation

is cut off. In the case of the vasomotor fibres to the blood vessels of the face, cutting off of the vasoconstrictor control might be expected to cause flushing, but it is possible that there are also

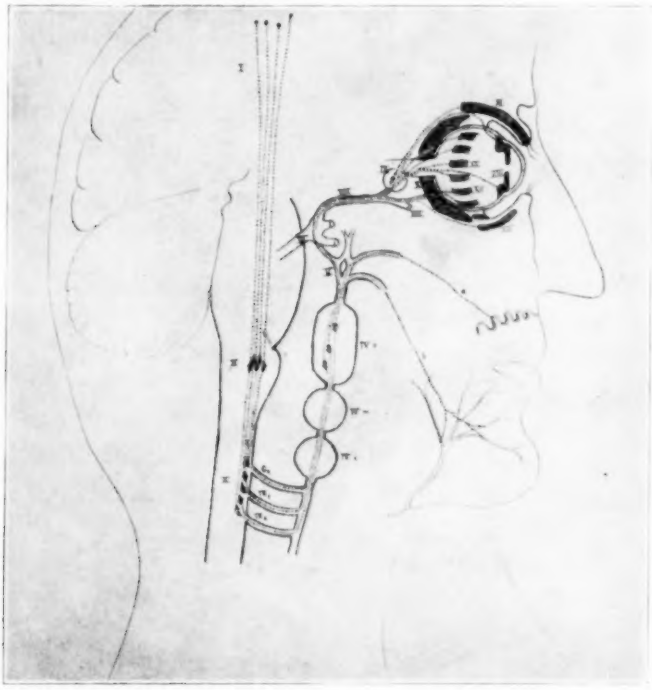

Fig. 1.

I. Cortical path.
II. Bulbar center.
III. Cilio-spinal center in lower cervical and upper thoracic cord. C. 8, Th. 1, and Th. 2, represent rami communicantes to cervical sympathetic chain.
IV. Cervical sympathetic ganglia, inferior, middle and superior.
V. Internal carotid plexus, giving off branches to (a) sweat glands of face, and (b) to blood vessels of face.
VI. Trigeminal nerve.
VII. Ophthalmic nerve.
VIII. Naso-ciliary nerve.
IX. Ciliary ganglion.
X. Orbital muscle (of Müller).
XI. Levator palpebrae superioris with sympathetic branch to the smooth muscle fibres.
XII. Tarsal muscles.
XIII. Dilator muscles of the pupil.

(N. B. The drawing is diagrammatic. No attempt is made to show the exact anatomic relations.)

vasodilator fibres which may bring about active flushing. Here again the exact anatomy is not known, so the reactions cannot always be interpreted. Stimulation of the cervical sympathetic causes increased sweating of the face, so interruption of these fibres brings about anhidrosis on the affected side. The smooth muscles of the eyeball being normally in tonic contraction keep the globe forward and the lids separated. Cessation of this function is followed by ptosis, narrowing of the palpebral fissure, and enophthalmos.

Due to the anatomic relations of the structures just described, certain symptoms are frequently found associated with this sympathetic syndrome. In the first place injuries to the spinal cord above or at the cilio-spinal center may cause varying degrees of spastic paraplegia, quadriplegia, or hemiplegia. Most common of all is the lower brachial plexus paralysis (Klumpke's paralysis) with atrophy of the small muscles of the hand and anesthesia of the dermatomes corresponding to the lowest cervical and upper two thoracic nerves. This indicates a lesion of the nerve roots before they enter the plexus. The recurrent laryngeal nerve may also be injured, causing hoarseness. In addition any number of traumata may be found, such as fractures of the vertebrae, injury to the larynx, and so forth. The wonder is that any of the patients with these bullet wounds of the neck survived.

Case 1.—Private, Co. K., 30th Inf. Age 23 years. Previous to the injury the history is unimportant. There is no suspicion of syphilis. *On October 11, 1918, at Verdun, the patient was struck by a piece of shell in the left side of the neck just above the mid-clavicle; the missile lodged in the soft tissue just to the left of, and slightly above, the spinous process of the 3rd dorsal vertebra. There was immediate paralysis of the left arm and for a week the patient states he saw double. By the last week in November he could move the shoulder, arm and forearm. Sensation also began to return except in the distribution of the 8th cervical root.* At about this time the wound healed. In early December voluntary motion returned at the wrist. He was admitted to U. S. A. General Hospital, No. 11, on November 30, 1918, and physical examination gave the following positive findings:

Voluntary motion at the left elbow is weak and restricted. There is complete loss of flexion and extension of the fingers of the left hand, and only slight extension of the wrist. The whole extremity shows atrophy; the fingers are stiff and cyanotic. *Sensory examination shows anesthesia in the distribution of the whole brachial plexus;* but by January 23rd, this hypoesthetic area was practically normal. With massage and electrical treatment there was marked improvement in the next three months,

but no return of voluntary motion in the intrinsic muscles of the hand. *Myosis, enophthalmos and ptosis of the left eye were noticed by the patient from the beginning.* Unilateral anhidrosis is present on the left.

Diagnosis.—(1) Injury to left brachial plexus, at first involving the whole structure, but improving, and in six months, leaving a paralysis only of the 7th and 8th cervical segments.

(2) Injury to the sympathetic fibres lying in the 7th and 8th cervical roots, left.

Ophthalmic Examination. — Enophthalmos, ptosis and myosis left side marked. Left palpebral fissure 10 mm., right

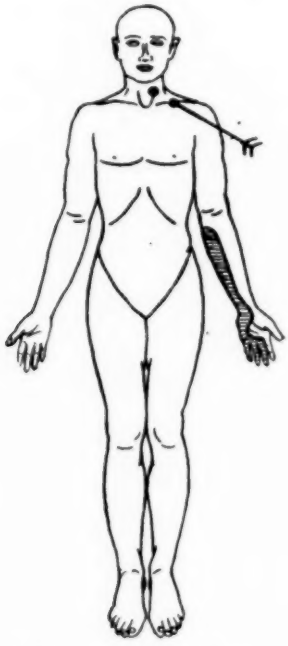

Fig. 2. Diagram Case 1.

13 mm. Both pupils react to L. A. and C., but left slower than right. Diameter left pupil 2½ mm., right 3½ mm. Under cocain left 2½ mm., right 5 mm. Tension left eye 13 mm. Hg., right 17 mm. Hg. No heterochromia iridis. Vision 20/20 in both eyes. Near point, left 11 cm., right 12 cm. Ocular movements normal. Left globe slightly elevated and left nictitating membrane slightly more prominent than right. Left cornea appears a little flatter than right. On excursion of the eye to the right, the difference in the size of the pupils increases slightly, while on turning to the left the difference diminishes slightly. Fundi and fields normal. No flushing of face, nor hemiatrophy noted. Lacrimation normal.

CASE 2.—Private, Co. L., 18th Inf.—Age 24 years. The past history is negative. There is no syphilis. *At Soissons, on July 21, 1918, he was struck by a piece of high explosive shell in the right forearm and was thrown about five feet by the explosion, landing on his right shoulder. The right arm was immediately numb and paralyzed.* At Evacuation Hospital No. 5 he was oper-

Fig. 3.

Case I. Showing Enophthalmos and Ptosis.

ated on and the bones of the right arm were set. No ether was necessary on account of the anesthesia of the arm. During the next three months there was no improvement in the paralysis. He was admitted to U. S. A. General Hospital No. 11, on October 24, 1918. Here numerous examinations were made and *the following is a summary of the positive findings:*

On the outer side of the right forearm is a scar of 1.5 inches long. *The right arm is completely paralyzed, and there is restricted motion of the shoulder.* Electrical examination shows normal response to faradic stimulation in the trapezius and supra- and infraspinatus muscles; all the other muscles of the right upper extremity fail to respond. With the galvanic current there is a slow wavy contraction in all the muscles that failed to respond to the faradic, except the intrinsic muscles of the anterior surface of the hand where there is no response. *Sensory examination shows anesthesia in the distribution of the 5th, 6th, 7th and 8th cervical and 1st thoracic nerves* (see chart). *There is unilateral anhidrosis on the right side of the face.*

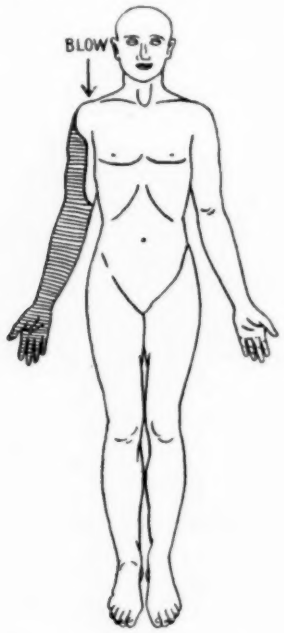

Fig. 4. Diagram case 2.

On November 14, 1918, an operation was performed by Lt.-Col. Charles H. Frazier. The posterior triangle of the neck on the right was explored and a bulbous enlargement was found that represented the remnants of the brachial plexus. It extended from the clavicle upwards, tapering off into a single trunk which proved to be the 5th cervical. The retracted stumps of the 6th, 7th and 8th cervical nerves could not be found, although search was made almost up to the intervertebral foramina. After this operation the patient states that he first noticed that his right pupil was smaller than the left. A second operation was performed on December 19, 1918, by Col. Frazier. The exposure was similar and the 5th root was identified and grafted with two

strands of the musculo-cutaneous nerve to a nerve in the shoulder, which was thought to be the circumflex.

Diagnosis.—(1) Evulsion of the 6th, 7th and 8th cervical roots and of the 1st thoracic root of the right brachial plexus with contusion and fibrosis resulting in complete sensory and motor paralysis of the right arm. (2) Interruption of the cervical sympathetic fibres, by the evulsion of the 6th, 7th and 8th cervical and 1st thoracic spinal roots, right.

NOTE.—It is probable that the oculo-pupillary symptoms were present immediately after the injury, but passed unnoticed; and

Fig. 5.

Case II. Showing Inequality of Pupils before the Instillation of Cocain.

that their onset had no relation to the operation, as stated by the patient.

Ophthalmologic Examination.—Enophthalmos, ptosis, myosis of right side marked. Right palpebral aperture 9 mm., left 12 mm. Pupillary reactions normal, but right slightly retarded. Diameter right pupil 2½ mm., left 6 mm. Width under cocain, right 2½ mm., left 9 mm. Ocular tension, right 12 mm. Hg., left 16 mm. Hg. Vision 20/15 both eyes. N. P. right 9 cm., left 10½ cm. Right eye slightly elevated. Ocular movements normal. On excursion of the eyes to the right, difference in the size of pupils diminishes, on excursion to the left the difference in size increases

slightly. Fundi and fields normal. This patient showed a slight hemiatrophy of the right side of the face.

CASE 3.—Private, Co. C., 58th Inf. Age 27 years. The past history is negative. *On October 5th he was struck by a piece of shrapnel while advancing at Verdun. This missile entered in the mid-line anteriorly just below the larynx and passed out of the lateral aspect of the neck through the trapezius muscle. There was immediate paralysis of the left arm and aphonia. Two weeks later his voice and movements of the left hand began to return.* A week later he noticed that his left eye was sensitive, and the lashes fell out. From this time on there was steady improvement. He was admitted to U. S. A. General Hospital No. 11, on Decem-

Fig. 6.
Case II. Showing Further Inequality of Pupils After the Instillation of Cocain.

ber 31, 1918. *Physical examination showed paralysis of the left deltoid and supra-* and *infraspinatus muscles, with weakness of the brachioradialis, biceps and triceps. No sensory disturbance. The voice was hoarse and laryngoscopy showed partial paralysis of the left vocal cord.* The left palpebral fissure was narrower than the right and the pupil contracted. During the next four months there was improvement in the voice and the arm movement, but the scapular muscles and deltoid are still atrophied, and weak.

Diagnosis.—(1) Contusion of left brachial plexus with a

severe lesion of the 5th cervical root, causing a more permanent scapulo-humeral type of paralysis. (2) Partial paralysis of left recurrent laryngeal nerve. (3) Lesion of left cervical sympathetic nerve.

Ophthalmic Examination. — Enophthalmos, ptosis and myosis of left eye marked. Left palpebral aperture 7 mm., right 10 mm. Pupils react normally, left being slightly slower than right, width of left pupil 2½ mm., right 3½ mm. Under cocain left 2½ mm., right 5 mm. Tension left eyeball 23 mm. Hg., right 25 mm. Hg. Left cornea appears slightly flatter than the right. Vision—right, 20/20; left, 20/20. Near point—left, 11 cm.; right, 13 cm. Ocular movements normal. Left eye slightly elevated. Slight diminution of relative size of pupil on

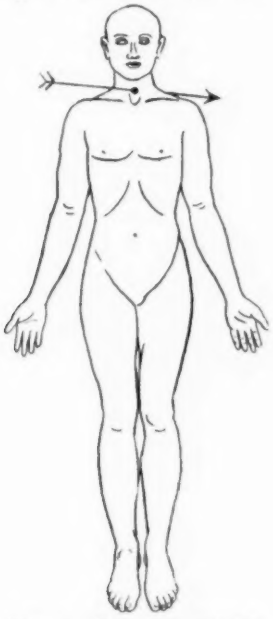

Fig. 7. Diagram case 3.

gazing to extreme left, with a slight increase in size on directing gaze to right. Fundi and fields normal. No disturbance of lacrimation or of vasomotor functions.

Case 4.—Private, Co. D., 47th Inf. Age 30 years. Past history is unimportant. No syphilis. *On July 30th, on the Champagne Front, he was struck three times. First by a piece of shrapnel in the neck entering just to the left of the thyroid cartilage and passing out behind the sterno-mastoid muscle at the same level. Secondly, by a machine gun bullet from behind, which fractured the 1st thoracic vertebra and lodged in the soft parts, being removed the next day.* And thirdly, a gutter wound in the biceps of the right arm. His legs were stiff and weak, and he was unable to walk. He could not speak and the left arm was

paralyzed. During September his voice returned, but was hoarse. In late October he could walk a few steps if supported.

On admission to U. S. A. General Hospital No 11, *the following symptoms were observed: The whole right side of the body below the third rib was anesthetic to pain and temperature stimuli. In the distribution of the eighth cervical and first and second thoracic nerves on the left there is anesthesia to all forms of cutaneous stimulation.* The arm is carried partly flexed, motion is limited at wrist and elbow; the thumb and fingers are spastic and weak with fibrosis of the joints. The muscles of the trunk are hypertonic and the tendon reflexes are greatly exaggerated with bilateral clonus. *Babinski's sign is elicited by touching*

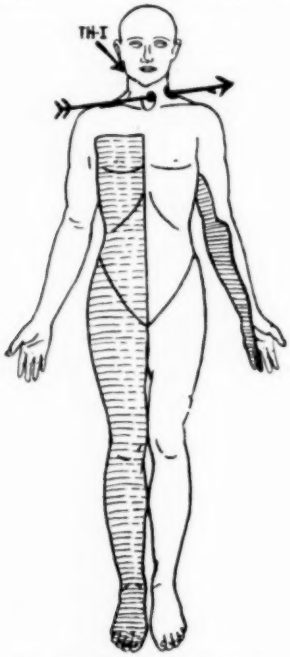

Fig. 8. Diagram case 4.

the patient anywhere below the third rib, and even by jarring the bed. Electrical examination shows that all muscles react to faradic current. *There is hyperidrosis of the right side of the face. The left eye shows ptosis, enophthalmos and myosis. X-ray reveals a fracture of the first thoracic vertebra.*

On November 5th laminectomy was performed by Lieut.-Colonel C. H. Frazier, and the cord was decompressed at C. 8, Th. 1 and Th. 2.

Three months later the patient was able to walk half a mile; his anesthesia on the right had disappeared, but was still present on the left arm. *The oculo-pupillary and sudomotor symptoms persisted.* The tendon reflexes were still exaggerated, and Ba-

binski's sign could be elicited, but the clonus had disappeared. The left arm was more freely moveable, but the fingers were still spastic and weak.

Diagnosis.—(1) Contusion of the spinal cord at the level of the eighth cervical and first and second thoracic segments, from machine gun bullet. (2) Interruption of the left recurrent laryngeal nerve, and of the left cervical sympathetic nerve by a piece of shrapnel.

Fig. 9.
Case IV. Showing Unilateral Anhidrosis.

NOTE.—It is possible that the oculo-pupillary symptoms are in part due to the cord lesion, but the above diagnosis seems the more probable.

Ophthalmologic Examination.—Enophthalmos, ptosis and myosis of left side, less marked than in previous cases. Left palpebral fissure 11 mm., right 13 mm. Pupillary reactions normal.

but left slower than right. Diameter left pupil 2½ mm., right 3½ mm.; under cocain left 2½ mm., and right 4½ mm. Tension same in both eyes. Vision, 20/20 in both eyes. Ocular movements normal in all directions. No change noted in the relative size of the pupils when looking to the right or the left. Fundi normal. No disturbance in lacrimation. Marked flushing on left side of face.

CASE 5.—Corporal, Co F., 26th Inf. Age 20 years. The past history is unimportant; there is no history of syphilis. At Soissons on July 19, 1918, the patient was struck in the right side of the neck by a machine gun bullet which entered 2 cm. above and

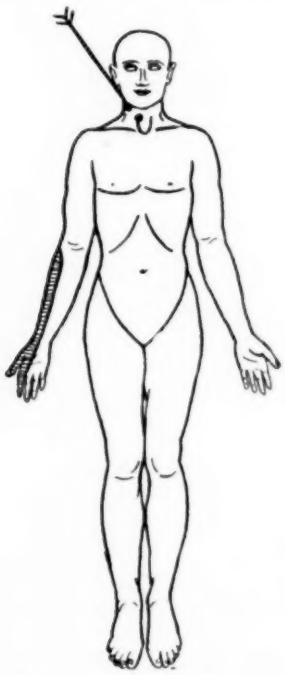

Fig. 10. Diagram case 5.

4 cm. to the right of the thyroid cartilage and lodged to the right of the vertebral column at the level of the 5th and 6th cervical vertebra. Four days later it was removed at operation. There was immediate paralysis of the right arm and shoulder, which began to improve after a few weeks. On admission to the U. S. A. General Hospital No. 11, on August 27th, motor disability was limited to weakness of the right arm and hand, with inability to flex the thumb and index finger. There were sensory disturbances in the area of distribution of the 7th root; light touch and pain were poorly felt, and there was pain and tenderness in the radial half of the forearm and hand. Electrical examination

showed that all muscles responded to the faradic current. Narrowing of the right palpebral fissure with enophthalmos, and myosis was conspicuous.

During October there was marked improvement, and late in December he was transferred to a Convalescent Detachment.

A special eye examination, December 10th, notes:

Vision.—Right, 20/15; left, 20/15.

External Examination. — Slight ptosis of right upper lid. Right pupil 3 mm. in diameter, left 4.5 mm., both react to light and accommodation. Ocular movements are good in all directions.

Ophthalmoscopy.—Fundi negative.

Diagnosis.—(1) Contusion of the right brachial plexus caus-

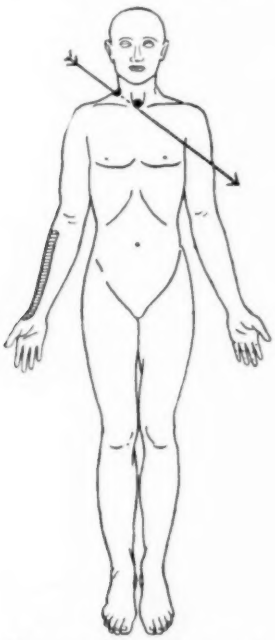

Fig. 11. Diagram case 6.

ing temporary complete paralysis of the right arm, with a residual irritative lesion of the 7th cervical root, causing symptoms for six months. (2) Interruption of cervical sympathetic nerve in the neck.

Ophthalmologic Examination. — Enophthalmos, ptosis and myosis of right side. Width of right palpebral fissure 8 mm., left 10 mm. Pupils react to light, accommodation. Diameter of right pupil 3 mm., left 4½ mm. Under cocain right 3 mm., left 7 mm. Ocular movements good in all directions. Fundi negative. Vision right 20/15, left 20/15. Unilateral anhidrosis on right side.

Case 6.—Private, Co. G., 28th Inf. Age 20 years. The past history shows no syphilis nor other important facts. On July 18th

he was struck in the right postero-lateral aspect of the neck by a machine gun bullet which passed forwards and downwards, coming out through the thyroid cartilage slightly to the right of the mid-line. There was immediate paralysis of this shoulder and upper arm, with aphonia for two weeks, and hoarseness thereafter. On August 21st the oculo-pupillary symptoms were noted. On August 27th there was no return of motor function and hypoesthesia was found on the right arm in the distribution of the seventh cervical. On October 3rd he was admitted to U. S. A. General Hospital No. 11. The examination here showed paralysis and atrophy of the right scapulo-humeral muscles, with marked atrophy and no response to faradic stimulation, except weak contractions in the triceps and biceps. There was no sensory disturbance. Myosis, enophthalmos and ptosis were present on the right, with unilateral anhidrosis. There was gradual improvement and on February 13th he was discharged with voluntary movement and faradic response in all muscles. The oculo-pupillary symptoms did not improve.

Diagnosis.—(1) Contusion of the outer cord of the right brachial plexus causing paralysis of the right arm and shoulder of the scapulo-humeral type. (2) Interruption of the right cervical sympathetic nerve in the neck. (3) Interruption of the right recurrent laryngeal nerve, causing hoarseness.

Ophthalmologic Examination.—Enophthalmos, ptosis and myosis present on the right. Right palpebral aperture 6½ mm. Left 8½ mm. Pupillary reactions normal, pupillary measurements not recorded. Vision, right 20/50, left 20/20. Refractive error present in right eye. Fundi negative. Unilateral anhidrosis.

CASE 7.—Private, M. G. B., 9th Inf. Age 28 years. On July 1st at Chateau Thierry, he was wounded by shrapnel in the neck and right arm. The projectile entered the neck 5 cm. above the junction of the inner and middle thirds of the clavicle and lodged against the spinal column, fracturing the transverse process of the 7th cervical vertebra.

For the first month he had pain in both arms, paralysis of both legs, and of the right arm, and weakness of the left arm. Bladder and rectal control was poor for six weeks. There was steady improvement and by March 6th, when he was admitted to U. S. A. General Hospital No. 11, he could walk stiffly. *The examination showed a Brown-Sequard paralysis with loss of pain and temperature sense on the left side below the 7th cervical segment, and weakness and spasticity of the right leg. There was also a partial musculo-spiral nerve lesion of the right arm. Myosis of the right pupil and "hemi-sweating" were noted on July 6th.* (For the findings at U. S. A. General Hospital No. 11, see special ophthalmologic report.)

At operation on April 15, 1919, a fragment of shell was removed from the right trapezius muscle.

Diagnosis.—Contusion of right side of the spinal cord at the level of the 8th cervical segment.

(NOTE.—The oculo-pupillary symptoms may be due to either

cord contusion or actual interruption of the cervical sympathetic nerve in the neck.)

Ophthalmologic Examination. — Enophthalmos, ptosis and myosis of the right side. Width of right palpebral fissure 10½ mm., left 12 mm. Pupils react normally to light and accommodation. Size of right pupil 2½ mm., left 3 mm. Under cocain right 3½ mm., left 6 mm. Ocular tension right 21 mm. Hg., left 23 mm. Hg. Vision, right, 20/20, left 20/20. Muscular excursions normal. On turning eyes to the extreme right there occurs a slight diminution in difference between the size of the two pupils, while the opposite occurs when looking to the extreme left. Fundi negative. Anhidrosis of the right side of the face.

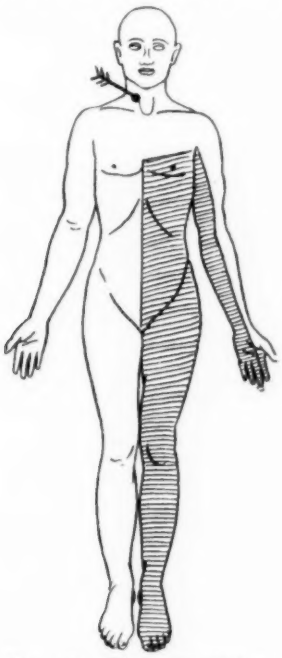

Fig. 12. Diagram case 7.

Case 8.—Private, Co. B., 11th M. G. B. Age 29 years. The past history is negative. Syphilis is denied by name and symptom. *On September 28, 1918, while on duty in the Argonne Forest, he was struck by a piece of aerial bomb, which entered the neck in the mid-line anteriorly and did not emerge. The left arm was immediately paralyzed completely and the legs were weak.*

There was also bleeding from the mouth and inability to speak. A week later voluntary motion began to return in the fingers and since then there has been steady improvement. The legs regained their motor power in two months. There was difficulty in controlling the bladder for two months. No eye symptoms were noticed by the patient. He was in bed most of the time

until his admission to U. S. A. General Hospital No. 11, on December 5, 1918. He could then walk a short distance and by January 1st could walk a mile.

Physical examination was made at various times from December 5th until March 17th and in various special departments. *A summary of the positive findings is as follows:*

Tachycardia constant between 110 and 130. The heart is otherwise normal. There is a small circular wound scar on the anterior surface of the neck in the mid-line over the larynx. Voluntary motion is limited at the shoulder, elbow and wrist. *There is atrophy of the left arm, forearm* and *hand*. The skin of this forearm and hand shows scaliness and the nails are long and

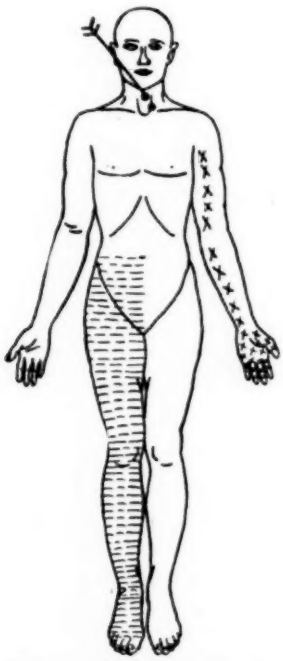

Fig. 13. Diagram case 8.

tender. *There is hypohidrosis in the left hand.* The tendon reflexes are exaggerated on the left, and in the left leg there is a short patellar clonus and a positive Babinski. *The whole right side of the body shows a hypoesthesia to pain and temperature below the level of the 10th dorsal segment. The left vocal cord is fixed near the mid-line. The left palpebral fissure is narrower than the right.* There is pain in the left shoulder and hand, and he muscles of the left arm are tender, especially the triceps.

Diagnosis.—(1) Contusion of the spinal cord in the region of the 8th cervical segment, more on the left than the right side. (2) Contusion of left brachial plexus, mainly of the 6th, 7th and

8th roots, with irritation. (3) Interruption of left recurrent laryngeal nerve.

Note.—The oculo-pupillary symptoms are probably due to the contusion of the cord, but might be due to root injury, or to injury of the sympathetic nerve in the neck.

Ophthalmologic Examination.—Enophthalmos, ptosis and myosis of the left eye. Left palpebral fissure 9 mm., right 11 mm. Pupils react to light and accommodation, but left slightly slower than right. Diameter left pupil 3 mm. Right 3½ mm. Under cocain left 5½ mm., right 7 mm. Ocular tension left 16 mm.

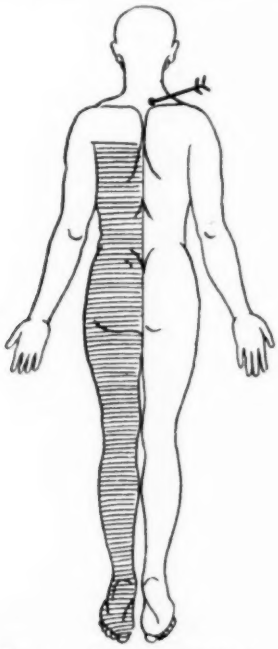

Fig. 14. Diagram case 9.

Hg., right 17 mm. Hg. Vision, left 20/20, right 20/20 uncorrected. Left near point 12 cm., right 16 cm. No abnormal change in the relative size of the pupils is apparent on turning the eye to the extreme right or left. Left nictitating membrane appears slightly more prominent than right. Fundi and fields negative. Slight diminution of sudomotor activity noted on left side of face.

Case 9.—Private, Battery I., 6th Field Artillery. Age, 31 years. Past history negative. No syphilis. On June 4, 1918, at Cantigney, the patient was struck in the back of the neck with a piece of high explosive shell, which fractured the 6th cervical vertebra and lodged in the vertebral canal. He was immediately completely paralyzed in all four extremities. About July 15th voluntary movement began to return in both hands and arms, and a month later in the left leg. There was no movement in the right

leg until November. There was complete loss of bladder and rectal control until October, when he began to have slight improvement. He was admitted to U. S. A. General Hospital No. 11 on November 6, 1918. Physical examination showed hypoalgesia below the 2nd rib on the whole left side. The right palpebral fissure was narrower than the left. There was motor weakness and spasticity in all four extremities; the movement of the right leg is limited to flexion of the toes, the right arm is weaker than the left. Treatment was directed to overcome spastic contractures and decubital ulcers. On January 23rd a laminectomy was performed by Lieut.-Colonel Charles H. Frazier, and a fragment of shell was removed from the dura at the level of the junction of the 6th and 7th cervical vertebra; it was pressing on the right posterior aspect of the cord. In the next three months there was slight improvement in the movement of the legs, due largely to physiotherapy, but the patient is still in bed with bad contractures of the legs; bladder control improved immediately after operation so that he could hold his urine for nearly two hours, instead of 15 minutes, as it was just before operation.

Diagnosis.—Injury to the 7th and 8th cervical segments of the cord, mainly on the right side, causing a partial Brown-Sequard syndrome and narrowing of the right palpebral fissure.

Ophthalmologic Examination. — Enophthalmos, ptosis and myosis on the right side. Right palpebral aperture 10 mm., left 11½ mm. Pupils react to light, accommodation and consensually. Slight difference in activity between the two noted, the right being a little slower than the left. Diameter right pupil 3½ mm., left 4 mm. Under cocain right 4½ mm., left 8 mm. Tension right eye 18 mm. Hg., left 22 mm., Hg. Vision, right eye 20/20, left eye 20/20. Right near point 10 cm., left near point 12 cm. Right eye slightly elevated from the normal position. Fundi normal.

Case 10.—Private, Co. I., 9th Inf.—The past history is negative and there is no evidence of syphilis. On July 18, 1918, at Soissons, the patient was struck by a machine gun bullet. At the time he was aiming at a machine gun nest in a tree and thinks the bullet came from that gun and struck him in the left cheek, ranged downward and came out just at the left of the spinal column. He was immediately paralyzed in all four extremities, but in two weeks he could move his legs and right arm freely. During the next four months there was steady improvement and in November he could walk a mile. In April, 1919, the positive findings were as follows: Fracture of the 5th, 6th and 7th cervical vertebrae shown by X-ray. Stiffness and limitation of motion in left hand and wrist. Tendon reflexes increased in arms and legs, less in left arm than in other extremities. Muscular spasms in arms and legs occasionally. Constipation is present; there is no bladder disturbance, but there has been loss of libido and potentia since the injury.

Diagnosis.—Contusion of the spinal cord in the region of the 7th and 8th cervical segments.

Ophthalmologic Examination. — Enophthalmos and myosis

present on the left side. No ptosis noted. Width of each palpebral fissure 10 mm. Diameter of left pupil 3½ mm., right pupil 5 mm. Pupils react to light, accommodation and consensually. Activity of the left slightly diminished. Tension left eye 20 mm. Hg., right eye 25 mm. Hg. Vision, left eye, 20/20, right 20/20. Near point of left eye 13 cm., of right eye 14 cm. Muscular excursions normal. Fundi normal.

CASE 11.—Corporal, Co. E., 125th Inf. Age 23 years.—On October 4, 1918, he was struck by a machine gun bullet which grazed the right shoulder and passed on into the right side of the neck and out the left side of the neck at a slightly higher level.

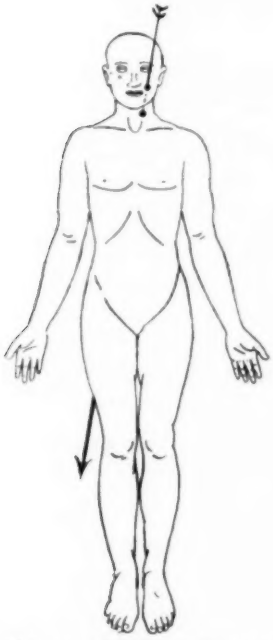

Fig. 15. Diagram case 10.

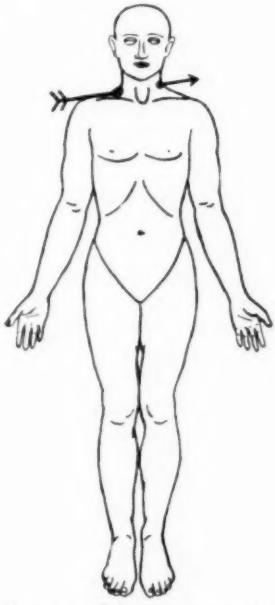

Fig. 16. Diagram case 11.

Aphonia was the only symptom noticed immediately and after a few weeks he was able to whisper hoarsely. He was admitted to U. S. A. General Hospital No. 11, Cape May, New Jersey, on November 5th and examination showed immobility of the right vocal cord. On February 7, 1919, this cord moved slightly and the voice was less hoarse. A slight narrowing of the left palpebral fissure was present; there was no myosis nor unilateral sweating. (See special Ophthalmologic examination.) Routine neurologic examination elicited no spinal cord symptoms.

He was discharged on February 27th, with improvement in his voice.

Diagnosis.—(1) Partial paralysis of the right recurrent laryngeal nerve, recovering.

(2) Partial interruption of the left cervical sympathetic nerve.

Note.—This diagnosis seems probable, because the symptoms do not correspond to those found either in the group of cord contusions or of nerve lesions presumably complete.

Ophthalmologic Examination. — Enophthalmos, ptosis and slight narrowing of palpebral fissure noted on the left side. No myosis present. Left palpebral aperture 11 mm., right 12 mm. Both pupils react normally to light and accommodation. Each measures 3 mm. in diameter, and under cocain the dilatation is the same on either side. Vision, right and left 20/20. Ocular movements normal in all directions. Fundi negative.

RESUME

In correlating the above data, the most striking fact is shown by arranging the cases in order of the severity of their ocular symptoms, and then observing the grouping of the neurologic diagnoses.

Cases 1 and 2, the most severe, are both root lesions. Then come four which are lesions of the cervical sympathetic nerve. All of these showed more conspicuous eye phenomena than the following four cord contusions. The last case had mild symptoms and seemed to be a nerve lesion, but the neurologic examination was unsatisfactory, and there is a possibility that this case was one of cord contusion, or partial interruption of the cervical sympathetic nerve.

Reviewing separately a few of the more important symptoms, the following results are presented:

(1) Enophthalmos was the most constant symptom, being present in all cases, but most marked in the two root lesions, with a diminishing degree of prominence as we go down the scale through the nerve injuries, until the cord contusions are reached, where in cases 10 and 11 it was faintly perceptible.

(2) Only one case failed to show at least a moderate degree of ptosis, and this was one of cord contusion.

(3) Myosis was present in all except case 10 (the neurologic examination of which, as we mentioned above, was unsatisfactory). It is interesting that the pupils of the cases with the more severe lesions, namely the root and nerve injuries, failed to dilate under cocain, while the cord contusions dilated, but to a reduced degree, the range being from 1 to 2 mm.

(4) Hypotension was present in only five out of eleven cases; the two root and three contusion injuries. The nerve lesions showed no difference in tension.

(5) In comparing the width of the palpebral apertures, we find that the greatest difference between the sound and affected sides is seen in cases 1 and 2 (root lesions), and case 3 (the most severe nerve injury). Each of these shows a difference of 3 mm. The other nerve cases register a difference of 2 mm., while three of the four cord lesions present a variance of 1½ to 2 mm.

(6) Sudomotor disturbances were recorded in over 50 per

Case.	Enophthalmos.	Ptosis.	Myosis.	Hypotension.	Palpebral Fissure.	Pupil.	Pupil (Cocain).	Vision.	Nearpoint.	Unilateral Anhidrosis.	Vasomotor Disturbance.	Hemiatrophy Facialis.	Heterochromia Iridis.	
I	+++	++	+	+	13 mm 10 mm	3½ mm 2½ mm	5 mm 2½ mm	20/20 20/20	12 cm 11 cm	+	−	−	−	R. Cord destruction. 7, 8 cervical.
II	+++	++	+	+	9 mm 12 mm	2½ mm 6 mm	2½ mm 9 mm	20/15 20/15	9 cm 10½ cm	+	+	+	−	R. Brachial Plexus. 6, 7, 8 cerv. 1st th. roots.
III	+++	++	+	+	13 mm 10 mm	3½ mm 2½ mm	5 mm 2½ mm	20/20 20/20	13 cm 11 cm	−	−	−	−	L. Cerv. Sympathetic nerve lesion.
IV	+	+	+	−	13 mm 11 mm	3½ mm 2½ mm	4½ mm 2½ mm	20/20 20/20	12 cm 11 cm	+	+	−	−	L. Cerv. Sympathetic nerve lesion.
V	+	+	+	−	8 mm 10 mm	3 mm 4½ mm	3 mm 7 mm	20/15 20/15	…… ……	+	−	−	−	R. Cerv. Sympathetic nerve lesion.
VI	+	+	+	−	6½ mm 8½ mm	……	……	20/50 20/20	…… ……	+	−	−	−	R. Cerv. Sympathetic nerve lesion.
VII	+	++	+	+	10½ mm 12 mm	2½ mm 3 mm	3½ mm 6 mm	20/20 20/20	9 cm 9 cm	+	−	−	−	R. Cord Contusion, Cerv. 8. (Possibly nerve lesion.)
VIII	++	+	+	−	11 mm 9 mm	3½ mm 3 mm	7 mm 5½ mm	20/15 20/20	16 cm 12 cm	−	−	−	−	L. Cord Contusion, C. 8. (Possibly nerve lesion.)
IX	+	+	+	+	10 mm 11½ mm	3½ mm 4 mm	4½ mm 8 mm	20/20 20/20	10 cm 12 cm	−	−	−	−	R. Cord destruction C. 7, 8.
X	+	−	+	+	10 mm 10 mm	5 mm 3½ mm	7 mm 5 mm	20/20 20/20	14 cm 11 cm	−	−	−	−	L. Cord contusion C. 7, 8.
XI	+	+	−	−	12 mm 11 mm	3 mm 3 mm	……	20/20 20/20	10 cm 10 cm	−	−	−	−	L. Cerv. Sympathetic nerve lesion.

cent of our cases, and as with the other symptoms, unilateral anhidrosis was present in the more severe lesions, namely cases 1, 2, 4, 5, 6 and 7. (Case 7 is classed under contusion of the cord, but it may possibly be a nerve injury.)

(7) Only two patients showed vasomotor disturbances, numbers 2 and 4. The explanation for this may be that we did not see our patients until four to six months after injury, and possibly symptoms that existed immediately afterwards had disappeared.

(8) Heterochromia iridis was not present in any one of the eleven cases examined. Presuming that this condition is due to paralysis of the cervical sympathetic nerve, this symptom might be expected in the cases classified under root lesions, and the more severe nerve injuries, where complete interruption was undoubtedly present.

Wilson[16] reported a case in 1917 in a girl 14 years of age, whose condition had existed for 12 years, and came on after swollen cervical glands. Calhoun[17] has recently reported four cases, and found only 33 others recorded in the literature. In all of these, heterochromia had existed since infancy or youth. After an exhaustive study, he says that heterochromia iridis has never been seen in adults, as the result of sympathetic paralysis from trauma.

Bistis[18] thus far has reported the only case occurring in adults, following paralysis of the cervical sympathetic nerve.

As all the cases here reported were adults, in whom the paralysis had been caused by gunshot wounds, the statement of Calhoun seems to explain the absence of heterochromia iridis in this series.

(9) Hemiatrophy facialis was observed to a slight degree in only one case, Number 2, a brachial plexus lesion, involving the 6th, 7th and 8th cervical and 1st thoracic roots. Weisenberg saw hemiatrophy in a similar wound, six months after injury, but as in the above, it was not pronounced. Possibly if we were to follow these cases for several months more, this condition would develop in a large number, as it has been observed quite constantly in paralysis of the cervical sympathetic of long standing.

(10) Vision was normal or better in all cases but one, in whom there was a refractive error corrected to normal. An interesting point was noted in the difference between the near points of the good and affected sides. Nearly all showed a variation of from 1 to 4 cm.

(11) According to Tournay[19], the relative difference in size between the miotic and normal pupils diminishes on directing the eyes to the affected side, while the opposite is true, when turned toward the healthy side. This we found true to a slight degree in a few cases, but it was not a constant symptom.

CONCLUSIONS

(1) Low lesions, affecting the brachial plexus roots through

which sympathetic fibres run, cause the most severe and typical Claude Bernard-Horner syndrome.

(2) Lesions involving the cervical sympathetic nerves, with complete or partial interruption, produce symptoms less severe, as a rule, than root injuries.

(3) Contusions of the cord result in the least pronounced phenomena, and are more prone to complete recovery than the first two conditions.

(4) Heterochromia iridis did not in adults occur following injury to the cervical sympathetic nerve.

(5) The pupils of the cases with root and nerve injuries did not dilate with cocain; those of the cord contusions did dilate.

(6) The near point of the affected eye was less than its fellow in over 50 per cent. of the cases, the average difference being slightly over 2 cm. It is difficult to draw any definite conclusion on this point, as the greatest variation was in a case of cord contusion, with only slight ocular symptoms.

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DISCUSSION

Dr. Edw. Jackson, Denver: Our thanks are due Dr. Scarlett and Dr. Cobb for their practical and unique collection of cases. The small number of these has been referred to, but the possible cause for this is that these cases are very rare. Horner based his original paper on a single case, and Mitchell saw but a small number from his large opportunities, and excepting for the operative mutilation of the sympathetic for epilepsy and glaucoma, I think there is no such series of cases in the literature.

As pointed out in the paper, the injuries to the seventh and eighth cervical roots of the brachial plexus, perhaps also the sixth and first dorsal roots, seem to be the injuries that produce the most prominent ocular symptoms.

In this connection we have to bear in mind that localization seems to belong to the cerebro-spinal system. Here we deal not only with the sympathetic, but with the connection of the cerebro-spinal with the sympathetic fibres; and probably the ganglia are the essential part of the connection.

One of the things that interested me particularly was the decreased effect of cocain upon the pupil, which was uniform in all cases. The pupil of the affected side was not influenced by the instillation of cocain, or at least only to a slight extent. Then the increase of accommodation on the affected side was a suggestive fact, and it was so uniform that it can be taken as an essential effect, of such injuries. The accommodation is greater on the injured than on the other side. That must influence our knowledge of the efforts of voluntary accommodation and what happens in the ciliary muscle. A fact, closely related, was the difference in the size produced in looking to one side. Looking towards the injured side decreased the difference between the two pupils.

With reference to the symptom of heterochromia, it seems to me that if that arises from injury to the sympathetic, it is a very late symptom. Four or six months is not long enough to be sure that it will not arise.

We are to be congratulated on having such a collection presented to this society.

Dr. Jos. Lichtenberg, Kansas City, Mo.: I think I will add one case to the collection. This case was seen in the service at the base hospital last fall. He had been injured in a battle in France. The point of entrance was about the right mental foramen, the exit about 2 inches to the left of the second dorsal vertebra. There was complete optic nerve atrophy and of course complete blindness. The history was blind at once. He must have had one of two things present: either immense hemorrhage or the optic nerve cut off by fracture. The x-ray showed the latter to be the case. There was also left ptosis, *contracted* pupil and enophthalmos, showing an injury to the left cervical sympathetic.

Dr. George F. Suker, Chicago: The study of the sympathetic nervous system is indeed an interesting one—either its normal functioning or its lesions.

The Horner's symptom complex, contracted pupil, narrowed palpebral fissure, reduced ocular tension, enophthalmos, apparent cheek atrophy and increased perspiration and vessel flushing on same side, is not an unusual occurrence in civil life. It frequently follows difficult forceps delivery, and in such case is very often temporary. It also follows civil injuries to the brachial plexus, and the cervical sympathetic chain. In the latter two the clinical picture is not always complete when it follows injuries; and, it may and may not be permanent. Whenever it remains permanent, an absence of the ganglion of Ribes is present. This ganglion

forms the connecting link in the brain between the two sides of the sympathetics and the physiologic function of the uninjured side is transmitted through it to the injured side by means of the intact intercommuniciating fibers. This ganglion of Ribes, is situated near the anterior clinoid process, is not always present in man and therefore in some cases the lesion is never entirely recovered from, though in most instances it is modified even at that.

In skull injuries, particularly in the fore skull, the cranial sympathetic (carotid and ophthalmic plexus) is involved and a more or less complete Horner's symptom complex obtains. When this is present it is a great aid in localizing the injury.

It is a symptom complex often overlooked as a whole or in part; for, in and out of itself, it does not produce any pathology which entails the integrity of the parts involved; it only produces a limitation in the range of activity of the muscles involved.

The anatomic arrangement of the cervical and cranial sympathetic fibers and ganglia is very bizarre as regards number of ganglia and connecting and intercommunicating fibers.

In my military service I saw many cases but did not study the effect of the lesion on accommodation as the essayist. From it I judge that we must rearrange our interpretation of the function of accommodation.

Dr. Wiener, St. Louis: Asked to permit Dr. Scarlett to show some slides, which show very nicely the difference of the two sides, one against the other, and some other interesting points.

Dr. Chapman, Milwaukee: When the pupil reaction was taken, was the action of each eye taken separately, with the other excluded, in order to determine if action was or was not consensual, or was that reaction ruled out?

Dr. Scarlett: The pupilliary reactions were taken separately with the other eye covered.

FOCAL INFECTIONS OF THE HEAD AS SOURCES OF SYSTEMIC DISEASES.

By James Joseph King, A. B., M. D.
NEW YORK CITY.

ATTENDING LARYNGOLOGIST, HOSPITAL FOR THE RUPTURED AND CRIPPLED. ASSISTING SURGEON, OTOLOGY, NEW YORK EYE AND EAR INFIRMARY

Assuming that the relationship of focal infections to systemic diseases is now an accepted fact, we desire to present in its broader aspects the subject of focal infections of the head as sources of systemic disease and to bring before you several new and important developments.

The subject is not new, for casual observations on the relation are found in the older literature. In 1789 Eyerlin of Christiana, in his "Materia Rheumatica ad Tonsillitis," considered the relation of tonsillitis to rheumatism as clinically evident. In 1818, Benjamin Rush reported a case of rheumatism of the hip accompanied by toothache, which was promptly cured by extraction of the decayed tooth.

For nearly one hundred years after the publication of "Medical Inquiries" by Rush, the literature has little or nothing on the subject. The review of the literature up to 1909 reveals the fact that no scientific proof of the connection between focal infections and systemic disease had been published. It was clinically evident that certain infectious diseases followed tonsillitis and the same organisms had been found in the tonsils and the secondary lesions. There had been so much clinical evidence up to 1909 suggesting this etiology that scientific proof seemed scarcely necessary.

From 1899 to 1909 over one hundred writers presented clinical evidence linking tonsillar infection to other diseases. In spite of all this clinical evidence, however, the majority of the medical profession remained skeptical up to ten years ago. During the last ten years many scientists, working in different fields, have presented an abundance of evidence to establish the scientific proof. To be more specific, during the past ten years more than fifty authors have contributed data based upon research and clinical work to prove the case from a scientific standpoint.

Under focal infections in the head, we include infections of

the tonsils, including all lymphoid tissue in Waldeyer's ring, teeth, gums, nasal accessory sinuses, middle ear, mastoid, and lateral sinuses—in fact, all cavities communicating with the mouth, nose, or naso-pharynx are included. Pus enclosed in any of these cavities is, for all clinical purposes, one and the same problem.

Consensus of opinion gives the tonsils first rank in importance as foci of disease; then follow the teeth, with the nasal accessory sinuses and middle ear coming in for third and fourth honors.

The late Dr. N. B. Potter, formerly professor of Clinical Medicine in Columbia University, said in 1916: "Wherever the infection may be, one or more of the foci of the central cause radiate to a vicious circle of complex pathologic conditions and frequently result in life-long invalidism." The list of diseases in which oral sepsis may prove to be of considerable or paramount etiologic significance is as follows:

1. Neurasthenia.
2. Neuritis—reflex or remote result.
3. Neuralgia.
4. Myalgia.
5. Myositis.
6. Arthritis—acute, subacute, or chronic.
7. Osteitis.
8. Periostitis.
9. Gout.
10. Basedow's disease.
11. Furunculosis.
12. Sepsis.
13. Endocarditis.
14. Pericarditis.
15. Myocarditis.
16. Chorea.
17. Arteriosclerosis.
18. Meningitis.
19. Pleuritis.
20. Bronchitis.
21. Asthma.
22. Pneumonia.
23. Nephritis.
24. Pyelitis.
25. Cystitis.
26. Gastric neurosis.
27. Peptic ulcer.

28. Appendicitis.
29. Colitis.
30. Cholecystitis.
31. Herpes zoster.

Long as this list may seem, it is not complete—for the writer could add dacryocystitis, conjunctivitis and urticaria, all of which have been recently cured by removal of infected tonsils.

In a recent contribution, Robert T. Morris, in speaking of gastric ulcer and cancer, urges a search for foci of infections, especially mentioning the teeth.

In an address before the American Medical Association, C. H. Mayo recently said: "Disease, then, is an inflammatory process from infection and the efforts at repair. Infections which produce the greatest number of diseases enter the system by way of the alimentary and respiratory tract. Somewhere in the line, then, of the alimentary and respiratory tracts and in the excretory ducts of the body lie the sources of the entrance of the organisms which terminate life in the majority of instances. In view of what is known concerning infections and their mode of entrance, the infected and diseased mouth and respiratory tract must be looked upon as serious menaces. More general and effective school inspection is recommended as a valuable prophylactic measure. Teeth, adenoids and tonsils require supervision and correction in the fight against preventable diseases of various kinds. The mouth is the harbor of many varieties of bacteria. The nasal sinuses and chronic mouth and throat infections develop anaphylaxis from the constant poisoning and these results are shown in hay fever, asthma, urticaria, etc. The infected mouth shows a tendency to acid reaction, and this acid change involves an additional danger in cell degeneration of malignant type, from chronic irritation. Bacteria are constantly taken into the stomach in the process of eating."

Rosenow, whose experimental work has done so much to put the relationship of focal infections to systemic diseases upon a scientific basis, has said: "In the light of our present knowledge the argument that infections in the mouth are so common in individuals in apparent health does not minimize their importance. These or other foci are so common in patients suffering from arthritis, neuritis, appendicitis, ulcer of the stomach and cholecystitis, goitre, and so forth, and so rare in individuals who have had superb health for years, that their direct etiologic rôle can scarcely be questioned.

"The most common location of the focus or source of infection probably is in the mouth, and the teeth as well as the tonsils must always be carefully examined with this object in mind. However, the question of the focus of infection is a matter not only for the stomatologist or the dentist, but for the general practitioner, the surgeon; every branch of medicine needs to be taken into consideration in order to trace the focus from which the organisms gain entrance to the body. The focus of infection must be regarded not only as the place of entrance of the bacteria, but also the place where the organisms acquire the peculiar propperty necessary to infect."

The results of eradicating foci of infections in the insane by Cotton, is a brilliant chapter in psychiatry. At the New Jersey State Hospital, the average rate of discharge of patients from the hospital was 42 per cent. That is, for a period of years previous to 1915, forty-two out of every hundred patients admitted were discharged; fifty-eight out of each hundred remained in the hospital for a period of years and died there. Since 1915, Cotton has searched for foci of infections in these insane patients and eradicated them. Since this practice was inaugurated he has discharged 87 per cent of the patients admitted to the Insane Hospital cured, or so much improved that residence in a madhouse was no longer necessary.

In a notable paper, "Relation of Teeth, Tonsils, and Intestinal Toxemias to Diseases of the Eye," just published, Bell, of New York, reports a number of eye diseases cured by the eradication of foci of infections.

Reyfuss has proven scientifically what we suspected five years ago. We made the observation in 1914 that patients with stomach complaints, such as dyspepsia, or indigestion, with foci of infections in tonsils, sinuses, or teeth, reported almost unanimously that the stomach condition had improved or disappeared after the foci of infection in the head had been eradicated. By his fractional examination of the stomach contents, Reyfuss has found the same infections present in the stomach as were found in the head. He has had remarkable success in the treatment of these stomach and intestinal disorders by having the primary foci in the tonsils, teeth, and sinuses eradicated. In this study, Reyfuss says that the stomach is protected from ordinary infection by the following barriers: (1) Acid secretion; (2) abundant blood supply; (3) more or less constant peristaltic motion; (4) thin coat of mucus lining the stomach wall. The constant swal-

lowing of infected secretions of the mouth, tonsils, and sinuses is, however, sufficient to overcome the natural barriers.

His work confirms that of Smithies, who is quoted in Mayo's article. Smithies, in an examination of the extracts of 2,406 different individuals with stomach complaints (dyspepsia, indigestion, etc.), showed that irrespective of the degree of acidity of such gastric extracts, bacteria were present in 87 per cent; cocci and diplococci in 83 per cent; short and long rods, often of the colon group, in 58 per cent; typical streptococci and staphylococci in 17 per cent; and leptothrix buccalis in 24 per cent. In fifty-four cultural studies of saliva from dyspeptic patients, streptococci and staphylococci were demonstrated in over 80 per cent.

CARRIERS OF INFECTION

The mobilization of our great army and the requirements made upon our medical men to keep the millions of men efficient and in good health has demonstrated the menace of carriers of infection. By cultures made from the throat and nasopharynx of men in the military camps last winter, diphtheria and meningitis carriers were discovered and isolated. Epidemics of diphtheria and meningitis were thus prevented. Men who developed tonsillitis probably were infected by hemolytic streptococci. In many cases the infection remained in the tonsils, reinfecting the patient as well as others. The writer saw many such cases in Camp McClellan among the 30,000 soldiers there, and its real danger was brought home to us during the epidemic of "flu," pneumonia, empyema, measles and scarlet fever. Death following a variety of acute infections—like measles, scarlet fever—is at present believed to be due to a secondary invader, usually in the guise of a streptococcus, rather than to the primary etiologic agent.

The investigations of Pilot and Davis and of Nichols and Bryan point to the tonsils as the principal foci of these hemolytic organisms which are so frequently found in cultures taken from the different parts of the mouth and throat. The evidence is in accord as to the predominance of the streptococci in the crypts of the tonsils, and it appears that the frequency of these bacteria is decidedly less in the throats of persons whose tonsils have been extirpated than in the throats of persons having normal tonsils. Outbreaks of disease due to the entrance of foreign virulent streptococci unquestionably do occur at times, as the epidemics of septic sore throat testify, but in general the streptococci infections

are presumably associated with preexistent foci, like the tonsils, which harbor the bacteria in the body.

Identical strains of streptococcus hemolyticus were found in the crypts of tonsils and in pus from empyema, and in fatal cases of bronchopneumonia, as a complication of measles.

Pilot and Davis thus summarize the possible factors responsible for the secondary streptococci infections: "The existent dormant organisms in the tonsils may become enhanced in their virulence through symbiosis or in some manner unknown by the primary virus (measles, scarlet fever, small-pox), or by the bacteria—such as the bacillus diphtheriae, the pneumococcus, and the bacillus influenzae. They may become active through the resistance of the local tissues of the respiratory passages; they may attain increased invasive powers through the lowering of the general resistance of the host overwhelmed by the acute or chronic toxemia. Probably all three factors are combined in certain cases, although one factor often appears to be more important than the others. Thus, in acute respiratory and throat infections, streptococci seem to spread from the tonsillar crypts to the adjacent mucous surfaces, descend into the bronchi and lungs, and enter the blood stream from these tissues. In chronic diseases, on the other hand, the diminution of the resisting power of the blood may admit the streptococci directly into the circulating blood stream without any marked local change in the throat.

METHODS OF EXAMINATION

The examination of the tonsil consists of inspection, pressure for pus within the crypts, plate culture from the crypts.

The examination of the teeth consists of an inspection of the mouth clinically by both physician and dentist, and by a radiograph of all the teeth. Experience has taught us that suspicious areas around the roots of teeth, as revealed by the x-ray, are generally worse than the films indicate. The nasal accessory sinuses are investigated by inspection of the interior of the nose, by transillumination, and by radiographs. The nasal accessory sinuses, with the exception of the ethmoid, may also be studied by irrigating them in the usual way.

TREATMENT

The treatment consists in eradicating the focus or foci of infection, practically ignoring which one is the instigator; in the case of tonsils where the crypts are infected with streptococcus hemolyticus, or as in diphtheria carriers, the only effective means

of curing them is their complete enucleation. In meningitis carriers, in whom the meningococcus was found in the naso-pahrynx, the method practiced in the army camps consisted in isolation and treatment with such antiseptics as Di-chloramin-T, 2 per cent, in chlorlazin as a spray. At the Rockefeller Institute, the carriers are placed in a humidor whose air is saturated with a 1 per cent watery solution of Chloramin-T. They are kept there for about twenty minutes once or twice daily. A few days of such treatment is usually effective, as shown by several successive negative cultures. In other more obstinate, or for whom this treatment is too irritant, local applications of such preparations as argyrol and peroxid are used.

In tonsillar infections of the cocci group (streptococcus, staphylococcus, diplococcus), we have found autogenous vaccines of distinct value in raising the patient's resistance. As our experience has increased, we are convinced that many sinus infections are secondary to primary foci in the tonsils or teeth. In such cases the sinus is curable by removing the primary focus, combined with appropriate local treatment.

CONCLUSIONS

(1) During the last ten years over fifty writers have presented scientific proof of the relationship of focal infections to systemic disease. This, in addition to the voluminous clinical evidence, has established beyond a reasonable doubt the etiologic relation of primary foci of infection to systemic disease.

(2) In order to cure patients, the primary focus or foci must be found and eradicated, practically ignoring which one is the instigator. With our broader conception, we endeavor to look over the whole body and correct what is obviously pathologic. A certain amount of enthusiasm and generalship in the cooperation of different specialists is essential. The focus is dealt with according to its location, by methods well known to all.

(3) The new developments in this field are:

1. The broad application of this principle, now accepted by all progressive medical men.

2. The proof of stomach and intestines becoming infected by deglutition of infected secretions from tonsils, sinuses, and teeth.

3. The relation of primary foci in the tonsils to the mortality rate in such acute infections as measles, scarlet fever, pneumonia, and influenza.

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DISCUSSION

DR. EMIL MAYER, New York City: For a number of years Dr. King has been working along the line of focal infections and has been able to teach not only the rhinologists and laryngologists, but also the general physicians. In one of our large hospitals in New York his work had resulted in such enthusiasm that the chief of the hospital came expressly to one of our meetings to endorse the result that had been obtained by Dr. King in the treatment of infections producing chronic diseases. From the work done by our men in the army within the last year or two, it does seem to me as if it were almost supererogation to tell anybody that such a thing as focal infections existed, and that we were prepared to take care of that particular thing. It seems to me then that we have really taught the general profession much more than we have taught ourselves. In some of the talks I have had with men since coming here to the meeting of this academy, I have been met with some remarks which are depressing. A statement was made that men will not make these bacteriologic tests. I say that if anybody presumes to be a specialist and will not use all proper methods for the determination of diseases, he is not a physician and he ought to retire. I feel very strongly about that because I feel that it is a simple thing for men to do and the right thing to do. I have brought with me a plate which shows the green deposit of a streptococcus viridans and which might be of interest. With it is an agar plate, and I am going to ask you to indulge me a few moments in order to show just how we make this plate and why we will not always get the

same results from one laboratory as we do from the other. In the first place this agar plate is mixed with human blood. Now it becomes very necessary that before that blood is used, that blood itself should be tested because it is most important that the blood used does not show antibodies for the streptococcus viridans.

COMPOSITION OF BLOOD PLATES

Young veal macerated, with fat eliminated, for twenty-four hours is used in place of beef infusion in making up the agar base. 1.5 per cent agar is used instead of 1 per cent—no salt, no peptone.

The media is titrated against phenolphthalein after a triple fractional sterilization so that the reaction is .3 to .5 acid. A 500 c. c. flask is melted at a temperature of 120 degrees to 140 degrees Fahr. and 5 c. c. of human blood are added. The plates are poured and incubated in a dry earthen oven for fifteen minutes at 185 degrees Fahr.

Streptococcus viridans give a very dense green after 12 hours.

Streptococcus hemolyticus gives a milky white, partly transparent area after 12 hours.

Gram negative organisms give abundant growth after ten hours, especially in a carbon dioxid chamber.

With the plate ready for use, the smear is made in the following manner: A double wire composed of platinum is first placed in the flame of an alcohol lamp and allowed to become red hot. That will destroy any germ upon this particular wire. Then when it is cool the patient's tongue is depressed and the wire introduced into the tonsil crypt, withdrawn, and then gently smeared over the agar plate. Then send it to the laboratory. I am asked to say something about the difference between a streptococcus infection and a staphylococcus. Well, here is the difference. Somebody once told me he could tell a streptococcus by the smell. Well, I have worked for forty years and I cannot and don't know of anybody else that can. The clinical diagnosis is one thing, proof positive another. As to some of the infections like Vincent's angina, I want to talk on this subject because it is near my heart. In 1901 I was the first one to present Vincent's angina in any English speaking country, whether it was America or England, and in all these years I have watched the progress of the knowledge of Vincent's angina and I note that to-day there is no reputable dentist who doesn't know what Vincent's angina is. Those of our colleagues who went to war saw much more of it. Two physicians from Canada were serving in the British Army and having seen a number of cases of Vincent's angina, wrote an article for the Journal of the American Medical Association as if it were entirely unknown to us. The question was asked, but not answered, as to what one would do in a tonsil operation if Vincent's angina were present. Now you can paint many solutions on a Vincent's angina throat from now till doomsday without result. Iodin solution or arsphenanin is often curative. Only recently my attention was called to the case of a woman whose condition in her mouth was diagnosed as due to cancer. One of our bright throat men saw her, took a culture and immediately reported Vincent's angina. Within a short time after the use of arsphenanin intravenously the condition is rapidly approaching a cure. In other words to go back to the focal infection, the general physician has been taught what they are. It is up to us as special men to do our duty and it is important for every examination to be made in fairness to the patient or else one of two things will happen —either that individual will lose his patients or what I fear more, the patients will lose their patience and the Christian Science tenets have more converts, and the doctor's reputation suffers.

DR. HERMAN JARECKY, New York City: I have been interested in this subject, but I am very sorry Dr. King did not define what is a focus. A tonsil does not constitute a focus. That cuts out completely the idea of focal infection. Dr. Beck, a short time ago, spoke of what a focal infection is. In the Sluder-Beck method of removing your tonsils you clear out your tonsil and capsule. Between that capsule and the tonsil tissue you get your mass of infectious material, but not in the crypts which are open. Those do not constitute a focus, so-called, of infection. You don't get infection of that kind from pyorrhea in the teeth. You may get some absorption. The focus of infection are so-called blind abscess cavities at the roots of the teeth and old stumps of tonsils in which there is a lack of drainage. As soon as a cavity is drained it stops being a focus. If you look at those cases presented by the general physician, you will find that although their tonsils were removed, yet a small piece of that tonsil tissue remains, and you will frequently bring about a cure by removing that piece of tonsil, because your crypts are irregular from beginning to end. You cut across your tonsil tissue, leave a portion behind and a scar forms and closes up the crypt and you start a new focus of infection, and that is the trouble in a great many cases where they are not cleared up. Another question is that of vaccines. You clear out your tonsils and teeth, open up your sinuses and so forth, still there has been in the current of the circulation or the lymphatics a number of these different germs of various kinds and they still keep on their infection in the system. You ask the orthopedic men and they will all tell you only those cases will be cured in which there is an acute exacerbation of the trouble. And why should an acute exacerbation take place in these highly infected places? When you grasp your tonsil with forceps you open up the vessels and some stuff is carried into the system. If you use your snare you force out this same material freshly into the circulation, and unless you have these things examined by a bacteriologist and a vaccine made you will not complete a cure. And those which last I have found in my experience frequently are cleared up by these vaccines.

DR. LOUIS E. BROWN, Akron, Ohio: I think we are deeply indebted to Dr. King for bringing up this subject. I have been doing some work along this line for a number of years, particularly in the last few years, and I simply arise to voice my approval of everything Dr. King has said, and emphasize two or three points. First, in reference to goitre. I cannot give you the source of my information at the present time, but the various authorities I consulted claimed that statistics show that many of their cases after removal of goitre did not clear until the tonsils were removed, showing the close relationship between the tonsils and the goitre, and claiming in many instances tonsils should be removed at the same time as the goitre operation in order to obtain the best results. The stomach conditions Dr. King has mentioned, I have had numerous cases of that character. I made my notation as he read his paper. In reference to the "Flu," I am convinced that the resistance of many of our patients that have succumbed to the "Flu" has been lowered by past throat trouble, and that the throat trouble was, probably in a greater percentage of the cases, of tonsillar origin. I investigated a number of deaths at our local hospital last year during the "Flu" and I found that a great many of the fatalities were cases in which they had had a great deal of throat trouble prior to contracting the "Flu."

DR. G. W. BOOT, Chicago: Rheumatoid arthritis is the same thing pathologically as otosclerosis. The changes in the bone are practically identical. Rheumatoid arthritis is generally conceded to be the result of a focal infection. If you get busy and remove the focal infections in your

cases of otosclerosis you will do them more good than by any other method of treatment now in use. Their hearing may not be improved, but in many cases you will check the progress of the disease and in a few of them the hearing will be better.

Dr. C. W. Hawley, Chicago: I do not know but what I am presuming a little in coming from the eye section to talk to nose and throat men. My excuse will be that I do a little nose and throat work. In 1909 or '10 little did I suppose that focal infection would extend to the eye field. I expected by this time to be absolutely out of the medical profession, I was going blind with a chronic uveitis. At the same time I had a patient with a terrific irido-cyclitis. I discovered that my uveitis was entirely due to intestinal intoxication. After treating the intestinal toxemia we both recovered, and now I have extended the investigation a little further along, and I find a good many cases of glaucoma due to focal infection. I want to differ from the gentleman from New York when he said that pyorrhea will not produce systemic symptoms. I will prove it to you on myself. From December until May I had a severe neuritis of the musculospiral nerve. The slightest movement would hurt. I could not raise my arm to my head. I suspected a focal infection. I had neglected a slight pyorrhea, so that in June I went to my dentist and discovered a draining pocket from one of my teeth. Three days after removal of the infection, I could raise my arm and in a week the pain was all gone.

Dr. Wm. W. Van Note: I wish to call attention to one thing about focal infection concerning the teeth. I came across some cases lately where the X-ray showed no trouble, but I searched for a focus of infection in a case of chronic iritis. I noticed a crowned tooth that did not look good. I had the crown removed and found a carious spot under the crown and after removal of that the iritis cleared up.

Dr. Jos. C. Beck, Chicago, Ill.: I just want to speak of one case, a condition not mentioned in Dr. King's paper. It was diagnosed at Hopkins' and Mayo's as a progressive muscular atrophy. A neurologist in Chicago verified the diagnosis. The gentleman who knows this case from his city, who referred him to me is also a member of this Academy and is present. The patient weighed about 250 pounds and still has his normal weight. The atrophy was very progressive in the shoulder muscles, and it was progressing quite rapidly when he came to me. The Hopkins people thought it was due to an infection. He presented himself to me for the purpose of finding the focus in or about the head. I found that he had a history of a fifteen-year-old antrum infection. Seven years since Dr. Lynch operated and partially cleared up. The patient had besides that, evidences of nonsuppurative sinuitis on the same side. He had an infected bound down tonsil on the one side, although he gave no history of having had tonsillitis. He had two teeth removed before he came to me, at the suggestion of the Hopkins people, and following that, he said he noticed that his condition of weakness, especially going on into his legs, was stopped. I found he had five more teeth condemned by the X-ray. I went into the sinuses and cleaned out the ethmoid cells and then went through the canine fossa and opened the antrum. I found a thick membrane lining the antrum which I dissected up and took a culture submucously. It was a very common organism, micrococcus catarrhalis, that grew from the culture. I removed his one tonsil and obtained a culture (retrocapsular) which showed the same organism. Following this operation on the tonsil and sinuses, I sent him on to the exodontist in order to be sure that we obtained as nearly as possible a culture uncontaminated from the suspected granuloma attached to the apex of the teeth. I further insisted that they drill out the apex of the sockets in order to

remove all possible infection and get a culture. The result of the growth from the teeth was a mixed culture of the streptococcus and the micrococcus catarrhalis. These organisms were cultured separately and vaccines made from them. Besides that, inoculations were made into animals (cat, rabbit, guinea pig and white rats). The vaccines were used and he obtained a negative phase after three or four injections, necessitating discontinuation of the same. The idea is, we are arresting the progress of a disease the etiology of which is not yet known. Of course the atrophy already present will not be restored.

Dr. Chas. Adams, Trenton, N. J.: Less than three years ago in a series of selective cases I removed the tonsils of twenty cases of mental depression. Seventy-five per cent of these were cured. Since that time I have removed a number with good results. Following an attack of influenza, a little child three years old had frequent attacks of tonsillitis. In the spring his tonsils and adenoids were removed and since that time the throat has been clear.

Speaking of Vincent's angina, many cases of follicular tonsillitis are due to Vincent's spirilla.

Dr. G. A. Moore, Palmer, Mass.: While investigating optic nerve changes in syphilitics, quite a few cases were found, which, while non-syphilitic, showed signs of optic atrophy.

These were in two classes—those with change in appearance of disc but with unaltered function and those with change in function as well.

In some cases the cause was found. The causes were infection of tonsils, apical abscesses, diabetes and intestinal faults. In diabetes and intestinal cases no results were attained comparable with those attained by removal of diseased tonsils and teeth. In the latter, removal of the cause definitely checked the progress of the change in a few cases; but there was, however, no restoration of lost function.

Dr. King (closing discussion): I thank you for the very generous discussion. I have not been able to cover the subject fully in my paper, but I mentioned what I considered the most important part, and I am glad that the men who have discussed it have added further matter to the contribution. Dr. Mayer's description of my routine technic of taking cultures for a great many years is correct. We take cultures from the crypts of the tonsils, and apply it to the surface of the culture plate. I think Dr. Jarecky misunderstood me. Dr. Mayer speaks of Vincent's angina, but that was not in my paper. We have found vaccines very useful and I reported many cases in previous contributions where cures have resulted from them after eradication of the infection. I believe that the possibilities of this line of work are unlimited. I quoted Dr. Potter's list of diseases in which he thought focal infection played an etiologic role. That list is not complete and I wish to say I think the field of work in this line is unlimited. Dr. Beck's case is very interesting. We have seen a good many of those cases in New York and are trying to treat them along this line.

TRANSACTIONS

OF THE

TWENTY-FOURTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

OPHTHALMOLOGICAL DIVISION

HELD AT
CLEVELAND, O.
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INDUSTRIAL CONSERVATION OF VISION

E. M. SHANKLIN, M. D.
HAMMOND, IND.

Some few years ago I presented a somewhat similar subject before the Eye, Ear, Nose and Throat section of the Indiana State Medical Association, since which time radical changes have taken place in the viewpoints of both the medical profession and the manufacturers. My personal observations have been made in the great Calumet region, commonly termed the "Pittsburgh of the West." Here we have thousands upon thousands of employes engaged in the iron and steel industries, which of course means a very large number of railroad employes, affording an unusual opportunity for the study of the problem.

But a few years ago it was practically impossible to interest a manufacturer in this question; he held the common opinion that a certain per cent of eye injuries was a result to be expected —a thing as unavoidable as depreciation of machinery—therefore why spend time in its consideration? The experience in one group of foundries, nine in number, may be taken as illustrative of the common findings of the early investigators. The private secretary to the president was placed in charge of a workmen's benefit association. In a short time his attention was called to the fact that eye injuries among the employes was indeed a common thing, that in a six months' period 6.5% of all employes suffered eye injuries. A safety department was organized and in a very short time eye injuries were reduced to 1.6%. Publication of this and other similar results soon led to the adoption of safety measures in various mills and shops, and today the casualty department is recognized as a most important factor in most manufacturing plants.

The work of medical organizations, chiefly the American Medical Association, through committees on conservation of vision, should not be overlooked. For some time a rather intensive publicity campaign was carried on with no little success, but during and since the war, the movement has been permitted to slumber.

Our problem concerns not only the part we can play in the prevention of eye injuries, but of equal importance is the proper

care and treatment of the injured eye. Three factors here concern us: 1. Meddlesome interference on the part of fellow employes. 2. Improper care by the company doctor. 3. Failure on the part of the employe to regard his injury as serious.

Every shop has its handy man, a fellow reputed to be clever in the removal of foreign bodies from the eye. His instrument usually consists of a knife blade, a match, toothpick or a corner of his handkerchief. We have all seen numberless cases of infection following the ministrations of this omnipresent and dangerous individual. A fellow employe, equally guilty, is the store room expert. In the average shop it is common practice to send all injuries to the store room for first aid. The "expert" in charge decides which cases should be sent to the surgeon, and administers to the others himself. This practice is particularly pernicious in the matter of eye cases. Only a few years ago this procedure was responsible for the loss of three eyes in one shop alone. These two trouble makers do not ply their skill with former frequency, however, due to education of employes and superintendents.

The average company surgeon has come to regard eye injuries as something demanding special treatment, hence does not meddle with them to so great an extent as formerly. However, we occasionally find one who feels that having seen so many eye cases, he is thoroughly competent to attend any that come along. Again, we have the doctor who will call an oculist in consultation and straightway fail to carry out instructions. A recent case in point is that of an employe who had lost an eye some years ago and suffered a severe injury to the remaining eye. Four days after the eye became infected an oculist was called to see the case. Among other things he recommended hot saline applications at intervals of two hours. Some days later he was again asked to see the case and found a hot water bottle had been in constant use, affording most excellent opportunity for the successful propagation of the twenty-seven varieties of pathogenic bacteria commonly supposed to repose in the ocular cul-de-sac.

Too often the company surgeon makes but a hasty examination of the eye and overlooks a serious injury. Further, these cursory examinations fail to reveal evidence of former injury, and the company is forced to pay unjust compensation. Only recently a case was settled in which a company paid for the loss of an eye due to cataract, with the almost certain knowledge that they were being mulcted. The company surgeon had no record of the case and admitted before the court that he had but casually

looked at the eye and knew nothing of the case. Failure to use atropin in certain injuries is another common cause of serious complications that are to be directly charged to the company doctors. The average general practitioner rarely uses a mydriatic, apparently having a wholesome fear of glaucoma.

No doubt it is your common experience, as it has been mine, that it is no little task to impress the average patient with the fact that eye injuries demand the best of care on the part of the patient. Somehow they seem willing to "lay off" on account of an injury to other parts of the body, but rather insist on working even in case of serious injury to the eye. The one thing I find hardest is to impress them with the fact that even the good eye must not be overworked.

The use of goggles, the greatest factor in the prevention of eye injuries, has become common practice among employes in the iron and steel industries, though we find one who will cheat a little at times. It is a common occurrence to have an employe come in with emery dust in the eye, and when asked about the use of goggles, to have him say he has them but did not put them on as he merely wanted to touch up a tool and didn't stop to put them on.

In certain departments of some of our plants men are compelled to wear goggles, and any evasion of this rule results in immediate discharge. The men generally scoffed at the goggle a few years ago but have now come to an appreciation of their real value. The camera played no small part in this educational process. Pictures of broken goggles which had actually prevented serious eye injuries were posted on the bulletin boards about the shops. Collections of broken goggles, with descriptions of how they had saved eyes, proved to be a popular exhibit. One company collected 287 pairs, with one or both lenses broken, all in a period of six months. Correcting lenses are fitted to the goggles in many cases, particularly the presbyopes among the boilermakers.

We are also concerned with the effect of exposure to intense light, particularly in the Bessemer and open hearth processes of steel manufacture. It has been shown that injury to the eyes will result from exposure to metal heated to more than 2,000 degrees F. Cobalt blue lenses are invariably used when inspecting the interior of open hearth furnaces, while in the Bessemer process a spectroscope is used at a distance of thirty feet. In the various welding processes, whether the oxy-acetylene or the

electric arc light is used, the operators have learned by experience that proper protection is essential.

The enactment of compensation laws by the various states has brought about many changes in the matter of industrial conservation of vision. Not the least of these is the apparent change in policy of many of the liability companies. Formerly many of them seemed to seek the cheapest medical attention they could get and particularly in eye cases did they object to paying proper fees, while now they seem to desire the best treatment obtainable. I believe much of this is due to the compensation laws. We know that many cases were settled on a ridiculously low basis years ago, in many cases less than one hundred dollars being paid for the loss of an eye, but under the new system, where all settlements are made under the eyes of industrial boards, it behooves those concerned to provide the best of care for the injured employe.

In the early days of compensation laws it appeared as though eye injuries were on the increase, while as a matter of fact compensation laws have materially reduced them. The apparent increase was due to the great number of malingerers. Under the old system an employe usually had need of a strong heart and a long expectancy ere he entered upon the long and devious course of a personal injury suit, as it was usually a matter of several years before the case was terminated. Under the new law it seemed easy to establish a claim and get an award. So it was that numberless ancient and almost forgotten eye defects found their way into industrial board hearings under the guise of recent injuries. In the early days of the Indiana board it was indeed a rare occasion when we did not have at least one case of trachoma at each local sitting. The claimant invariably declared he had only recently acquired his trouble, all due to a piece of scale, or perhaps on account of working in dust. Occasionally they were attended by a physician who declared the trouble to be solely due to a foreign body. In one instance we had the sworn declaration of a perfectly respectable physician that the period of time required for development of third stage, with pannus, was but a few weeks, that is from the time of infection until the trachoma process was complete. Many of our large companies refuse to permit trachoma victims in their plants. One such company referred a case to me for diagnosis and upon receiving my report, advised the man that he must be operated at once or lose his job. He took employment with another company and in a short time made a claim for compensation. It so happened that I was

asked to see him and make a report, whereupon he was advised as in the first instance. Changing employment again, he soon made his claim for compensation and was again sent to me. This time he consented to operation.

Some few years ago a man was sent to me for examination, claiming total loss of vision in one eye following a trivial accident. He had a marked squint and a cataractous lens, neither of which had to do with the alleged injury. When advised of this report he made no further claim on the company. This past summer he was sent to me by a different company, alleging he had lost a perfectly good eye. It seems he had had an injury to the blind eye resulting in enucleation, and was asking compensation for 100 weeks, the maximum award in Indiana. The record of my former examination resulted in an award of four weeks, covering the period from the date of the injury to the end of convalescence following enucleation, the board ruling that he was not disfigured by wearing an artificial eye.

If we are to play our full part in conservation of vision we have yet another obligation to employe and employer. Inquiry as to the cause of accident will often enable us to make suggestions that will bring about such changes as will make similar accidents impossible. A large shop installed devices to prevent eye injuries from emery dust and the company oculist was so advised. However, he noted that these injuries, while not so common as before, yet were so frequent as to attract attention. Investigation revealed that the employes immediately discarded their goggles upon the installation of the devices, feeling that they were perfectly safe at the wheel, while as a matter of fact the air was filled with minute particles. In another instance it was noted that railroad engineers employed at night work in certain parts of the yard were afflicted with a rather peculiar form of conjunctivitis. Due inquiry was made and it was shown that on a particular job a number of flaming arc lights were directly in the line with the target which they had to watch closely. A change in the lighting plan immediately proved efficacious.

Inquiry as to the date of injury will often reveal a delay of several days in reporting the injury. Only this month I sent a report to the general safety agent of one of our great railway systems in which I reported a delay of one to six days in going to the company oculist for treatment. Within less than one week a bulletin was posted in the local yards calling attention to this and urging the men to report for treatment immediately upon

receipt of injury. You may feel that this takes time—it does. But if we are to do our part in the conservation of vision we must give some time to these details. The casualty managers are doing a wonderful work, but without the active cooperation of the oculists they cannot hope to accomplish all that is to be accomplished. My plea, then, is for a more intimate relation between our branch of the profession and the men actively engaged in the prevention of eye injuries.

DISCUSSION

DR. V. A. CHAPMAN, Milwaukee: Dr. Shanklin has reviewed quite thoroughly the progress and difficulties encountered in the industrial conservation of vision. I had hoped that the doctor would be able to give us information concerning disturbances of vison and pathologic eye conditions known generally as occupational diseases of the eyes, particularly those of comparatively recent development, which occur in workers in chemicals in connection with the munition factories and other plants of like character.

I had also hoped that he would particularly take up and discuss definitely standardized protectors recently proposed by the Bureau of Standards of the U. S. Government. I am not enough familiar with these devices to discuss them intelligently. I trust before this discussion is closed we may hear from some one who has been more intimately in touch with the affairs at Washington, covering this part of the question.

The essayist does not touch upon the method of determining compensation to workmen following injuries to eyes. Therefore, I assume that it is not permissible to discuss that question in connection with this paper. This feature I discussed to some extent in my paper before this society at the Pittsburgh meeting.

There is one feature of industrial conservation of vision which I wish to speak of here, as indeed I have spoken of it before this society at a former meeting, and that is the negligence by employers of labor regarding the relation of vision of the employee with respect to the work that the employee is placed to do.

The employers of labor in great factories go to great expense in getting an efficiency expert to plan their factory buildings; to lay out the floor plans as to the placing of their machinery in the factories so that it will work to the best advantage; largely due to the efforts of the illuminating Engineering Society, they have paid a great deal of attention to proper lighting in the factory rooms. They realize the necessity of all this for the promotion of the greatest output efficiency. Yet in the face of all this, they hire workmen to operate these machines without the least regard to the workman's visual acuity, which has much to do with his capacity and their ability to get the highest efficiency from the plant.

I pointed out in an editorial in the Journal of the Michigan State Medical Society some years ago the necessity of examining the eyes of prospective employes before they are taken into employment. The wisdom of this course as a routine has been demonstrated many times. Some

large employers of labor are doing it, and I cannot understand why most are not. I believe they will come to a time when a bureau will be established which will provide accurate information, from records, to all employers of labor, and Industrial Commissions, concerning the physical condition of any one whom they are about to employ or about whom such information is needed. A clearing house, by which the employer will not only receive protection in case of industrial accidents, but, knowing the physical condition of the man he is hiring, especially as to his vision and hearing, will be able to place the man at proper work, to the mutual advantage of both employer and employee. This would lessen the danger which an employee of low vision works under at certain employments. It would enable the compensation board of the Industrial Commission to render a just verdict as to the compensation the workman is entitled to after he has received an injury. It would enable an employer to place his employees at such work as their vision entitles them to do with the greatest efficiency.

I have seen a man employed on a structural steel building a hundred feet from the ground, who had vision in one eye of less than 20/300. While at work high on this structure, a piece of steel flew into his good eye. The man was helpless. He had sense enough to cling to a steel beam with his eyes shut until help reached him. If he had tried to make his way down, or even to a scaffold, he probably would have fallen to his death. That man belonged on the ground.

Not long ago, one of the noted knitting factories of Milwaukee installed a specially devised machine to do fine knitting which had formerly been done by hand. It is a well-designed machine and a marvel of efficiency. A few weeks after it was installed, the manager of the factory asked me for help concerning the trouble they were having about this machine. None of the girls employed upon it were able to operate it for more than a few days. The work required close watching of a part of the mechanism during its operation. Some seven or eight girls consecutively had refused to work on it after a few days because it gave them severe headaches and they could not stand the work. At first it was thought that the machine would have to be modified some way or altogether abandoned. I suggested that perhaps the trouble was with the workers and not the machinery. They sent to our office one of the girls who had been operating the machine. She liked the work and wanted to continue it; but simply could not do it on account of the eye strain. The manager said if possible to do so to get the girl's eyes in condition to operate this machine, no matter how much time it took or how much it cost.

Upon examining her, we found that the girl had considerable refractive error and some heterophoria. Under a short course of treatment and the proper correction of refractive errors, the girl has been operating this machine for months with the greatest satisfaction to herself and her employers. This matter is worthy of deepest consideration in the industrial conservation of vision.

DR. G. H. MUNDT, Chicago: Dr. Shanklin's was a paper in which he generalizes a great deal, the subject being so large that he had no time to specialize, and his discussion is interesting and very important. The man who has a severe injury to his globe will get into the hands

of some one competent to care for him, but probably not the man who has a little thing. The man who has a foreign body on his globe, perhaps in the pupillary area, which should receive more careful attention, will get the same care as if it did not involve the visual portion. If the foreign body is in the cornea it would probably receive the attention of a fellow employe. Every time you find a railroad employe unable to do his work because of difficulty of vision you will have trouble with the union, and until the union is educated that it is not safe for the man, for the employer or the general public that he be employed, you cannot be as careful in employing a man as you should be, so we have another field in which to educate people.

Dr. F. Park Lewis, Buffalo: Two topics are in Dr. Shanklin's valuable paper—the first concerns the necessity of correct and timely treatment of injured eyes; the second the prevention of injuries.

The first of these is surgical—the second is sociologic. The experience of the National Committee for the Prevention of Blindness is that only through the cooperation of those employing labor can large preventive results be secured.

This committee has published much valuable literature, including a survey of Buffalo industries—but the best results will never be obtained until some organized movement shall be undertaken which shall be universally applicable. There should be a group in each city or town to advise with the manufacturers as to the measures that should be taken, as otherwise the initiative will be lacking. The unions do not wish preliminary visual examinations, but when the unfairness of exacting compensation for a visual loss that antedated the injury is generally understood, it will be evident that a test of sight should precede the employment of everyone whom the state insures.

Dr. Nelson M. Black, Milwaukee: Dr. Chapman brought up the question of the standardization of goggles for the protection of the eyes, and perhaps all of you have received the tentative National Safety Code for the Protection of the Eyes, issued by the Bureau of Standards at Washington, D. C. In that they divide the various processes in which it is necessary that the operator be given protection for the head or eyes or both. These can be divided into nine groups, each one of which requires a protector of a particular type. The examples given under each group are only illustrative and are not intended as a complete list of the operations or processes for which protection is necessary. These groups are as follows:

Type A—Processes where protection from relatively large flying objects is required:

Examples of these processes are chipping, caulking and riveting.

Type B—Processes where protection from flying metal are required.

Examples of these processes are babbitting, pouring of lead joints in cast iron pipe, pouring of hot metal and dipping in galvanized tanks.

Type C—Processes where protection from dust and light flying particles is required in shop work.

Examples of these processes are scaling and grinding, stone dressing and wood working.

Type D—Processes where protection from gasses, fumes and liquids is required.

Examples of these processes are handling of acids and caustics, working in or around places where nitrous oxide fumes are likely to be evolved, dipping in galvanizing tanks, japanning.

Type E—Processes where protection for an excessive amount of dust and light flying particles is required.

An example of this process is sand blasting.

Type F—Processes where the protector will intercept injurious radiant energy to a moderate degree.

Examples of these processes are oxy-acetylene and oxy-hydrogen welding and cutting, open hearth Bessemer steel and crucible steel making, furnace work, and electric resistance welding.

Type G—Processes where the protector will intercept injurious radiant energy and a large part of the visible radiant injury.

Examples of these processes are electric arc welding and cutting.

Type H—Operations where protection from dust and wind is required.

An example of this is truck driving.

Type I—Operations where protection is required from reflected light or glare.

Examples of these processes are long exposure to snow-covered highways, exposure to the glare from lights, as in the life-testing of lamps, exposure to reflected sun light, from roofs, road beds, etc.

Dr. A. G. Bennett, Buffalo, N. Y.: The gentlemen have spoken on what I had in my mind, but two points were not touched on: one was what kind of goggle. There is something about it from the other side. In the early part of the war, after America entered, in five weeks I had seven cases seriously injured from breaking goggles. In two cases the cornea was divided across and in one case the sclera was perforated. In one case the eye had to be removed. Five cases in seven weeks! I presented the request that the goggles should be properly made.

The other point was the question of compensation and how really to determine what is the true compensation for each case. At present the commissioners give us the vision on the 20/20 standard. Now a man with a vision of only 20/40 gets the full compensation for the loss of vision. He has lost some vision in his color sense and stereoscopic sense; but it does not seem a right ruling that the loss of one-half his central vision should go for the loss of that eye. The loss of vision is not simply the loss of central sight.

Dr. Shanklin, closing discussion: Several of the discussants have mentioned that employes and the unions are opposed to physical examination of employes. If you will read the demands of the steel workers now out on strike you will note the last clause is as follows: There shall be no physical examination of employes.

If the Calumet region is to be taken as a criterion, the iron and steel industries are waking up to the fact that physical examination of employes is necessary. At least 50 per cent of our industries are now working out plans to this end. Most of the railroads require complete physical examination of all applicants for employment, though we have one line that has no such requirement. I recently treated one of their employes for a severe eye injury, and when discharging the case remarked that I could not report him ready for work until the mydriatic effect of the atropin had passed away. He replied that the company had no such rule, that the only

requirement for employment was that a man should be less than 96 years of age and be able to see a box car ten feet away.

In this matter of compensation, I am not ready to adopt any of the percentage tables that have been suggested. I like Dr. Chapman's table better than any others I have seen, but I am not ready to accept it in its entirety. As Dr. Francis remarked to me a few moments ago: "Would you personally be willing to accept an award based on the Chapman or Allport tables? Put yourself in the place of the employe and see what you would do."

HYSTERIC AMBLYOPIA

FREDERICK F. TEAL, M. D.
LINCOLN, NEBRASKA

In trying to reconcile the various theories and ideas as to the causes of Hysteric Amblyopia, I finally gave it up. The more one pursues the subject, the more illusive it becomes. Some cases develop from apparently no cause at all.

There are two facts that I think we can recognize, although I will not attempt to elaborate on them. One is that there is in the beginning of Hysteric Amblyopia a blocking of the nervous pathway from the nerve structure of the eye to the higher brain centers, and that it is produced by psychic shock of some kind. This latter may be worry, fear, depression from sickness, excitement, or what not.

The chief characteristics are few, and though at times unmistakable, one's diagnosis may become uncertain in the presence of a malingerer, or of a case of hysteric manifestations in a blindness of organic origin. These chief characteristics are lowered vision, coming on usually in a short time, disturbance of accommodation, partial or total loss of color sense, contracted fields for form and color, with anesthetic areas on the skin. With all these, no fundus changes are demonstrable.

With this brief resumé, I wish to present a few cases for your consideration.

CASE 1. Aug. 14, 1913.—M. M. Age 17. Single. White. Family history—good. Habits—good. No past disease of consequence, or operations, until puberty at 15. Since then has headaches and insomnia. Good weight and height for her age Strong looking girl. Exceptionally bright mentally. Last month, while attending a picnic, fainted. Ever since she has had attacks, called, by her physician, hysteria. Has convulsions, which are not Jacksonian, pulls her hair, screams, clasps her hands to her heart and lies with eyes shut. Violent headaches at times, a little all the time, and sleeps very little.

She was referred to me by her physician for fundus examination. Examination showed pupils respond to light and accommodation, the right pupil being a little larger than the other.

Both fundi looked the same. Edges of discs quite blurred and quite red. There was no swelling of discs, but an absence of cupping. Veins—a trifle larger than average. Arteries—normal.

Fields for form and color contracted, red and blue reversed.

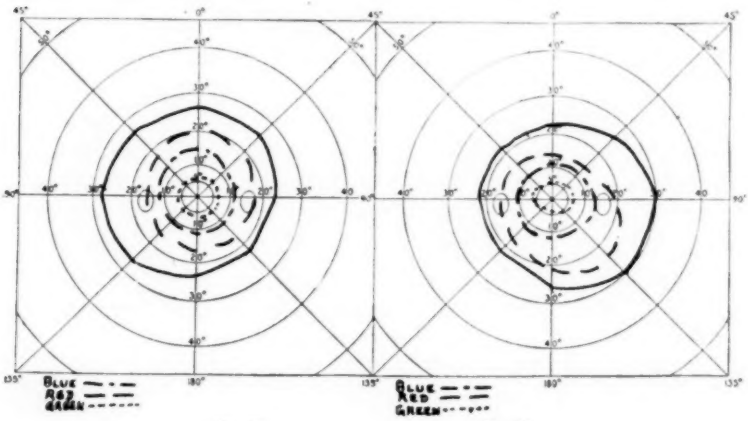
I could not say there was an optic neuritis, but the condition was at least suspicious. I called in another oculist who also

was in doubt as to whether there was a beginning retinitis, or hysteria. Vision O. D. 15/30; O. S. 15/30.

On account of lowered vision and the suspicious appearance of fundus a diagnosis of intracranial lesion was given with a mental reservation that I might be wrong.

She was sent to the sanatorium where the examination showed as follows: All chest organs and functions—normal. Blood count—4,500,000 reds, 8,000 whites. Hemoglobin slightly reduced. Von Pirquet—negative. Spinal Wassermann—positive. Spinal fluid not under pressure. Several areas of anesthesia of the skin.

She was put on antisyphilitic treatment and in a year's time during which she had numerous convulsions, she continued to improve. She has gone home, and returned at different times on account of other seizures which, however, were light. At the present time, September 15, 1919, she has had no convulsions for



L. E. R. E.

two years, but a year ago had a partial hemiplegia of left side, which caused her to drag her left foot in walking. At the same time the right pupil became dilated and has since remained so—6 mm. in diameter. This pupil reacts to light but not to accommodation. She is not able to read at close range with that eye. The other eye is normal as to light, accommodation and size of pupil. Refracted and given

O.D.+0.25s⌒—25c×90, 15/30
O.S.+0.75c×180, 15/15

Examination of fundus of right eye shows lower temporal artery thinned out just below disc, with a surrounding pale area in the retina. Below the thinned out portion, the walls of the artery are thickened and rough. This is undoubtedly a case of gumma with a syphilitic endarteritis, and an accompanying neuroretinitis, displaying symptoms of an hysteric character.

At present her general health is good and treatment seems to have halted the progress of the disease.

This case illustrates a point or two which I wish to make in my paper; first, that it is sometimes difficult to differentiate between an amblyopia of a functional and that of an organic origin. Second, it also impresses us with the fact which we must not overlook, that we can have hysteric manifestations in a person who has an organic lesion.

Case 2.—Jan. 12, 1917.—R. C. K.—R. R. fireman, age 30, single, white. Mother living, in good health. Father died at 38 of T. B. Had several children's diseases, but does not remember what they were. Has never been sick otherwise. Rather loose habits. A strong robust man; inclined to be surly. Got a cinder in left eye 3 months ago, since which time has complained of poor sight in that eye. Three weeks later fell off running board of locomotive, hurting his back. He was terribly frightened, as the engine was moving rather fast, but got up and walked off, seeming to recover from his fall without any damage being done. Has no other complaint except a nasal catarrh.

Nasal mucosa dry. Throat normal. Teeth O. K. Urinalysis, X-ray of sinuses and Wassermann negative. Blood pressure 120.

Eyes—Pupils react to light but not accommodation.

Vision—O. D. 15/120; O. S. 15/240

Retinosc—O. D. + 1.25s; O. S. + 1.25s

Ophthalmoscope.—Anterior ocular segment normal in both eyes. Fundus shows no abnormal change in either eye. Fields greatly contracted for form and color, with blue and red interchanged—color sense slow.

A diagnosis of hysteric amblyopia was made. Six weeks later the railroad company reported that he had been examined by another oculist; that his eyes were all right, and asked me to examine him again. I found his vision normal in both eyes, with form and color fields normal.

Case 3.—M. K.—April 14, 1919.—Teacher, female, age 22. Habits good; father living, age 54; in good health, but has attacks of iritis. Mother living—good health. One sister living who had poliomyelitis and is now a cripple. Patient weighs 135 lbs.; 5 feet 6 inches tall; always has been in good health, and is a strong robust girl. Had usual children's diseases.

She has been working harder than usual lately, and losing considerable sleep. Engaged to a young man who has been in service in France for over a year. She has been expecting him home for several months, expecting to be married on his return and has worried a good deal over the delay. Her only complaint is of much blurring of the right eye since yesterday.

Chest findings normal. Bowels normal. Skin—anesthetic areas on right side of body—none could be found on left. Urinalysis negative. Wassermann negative. Von Pirquet negative. Nose, throat and teeth normal. Menstrual function normal. We had refracted her several times during the past few years and she had never shown anything unusual in the eyes outside of a small refractive error.

Vision—O. D. — 15/200; O. S. — 15/15

Pupil reacts to light, but not accommodation, in the right eye.

Left eye, pupil reacts to light and accommodation. Fields—O. D. Marked contraction of form and color, especially in upper portion of field, green could not be seen at all. There was a small scotoma in upper and inner portion of field averaging about 7 mm. in diameter. O. S.—Fields normal. Color sense not affected.

Ophthalmoscope.—Right eye, the one affected, disclosed a small area of an old choroidal degeneration below and between the macula and disc. No other pathologic sign. Disc normal, also arteries and veins.

Diagnosis.—Hysteric amblyopia (monocular). She was sent to her physician for general treatment. In two weeks of rest and care she had greatly improved. One month later, during which time her sweetheart had landed in this country, she was examined and had 15/20 vision which later improved to 15/15.

I report this case because the blindness was monocular, and the anesthesia was correspondingly on one side.

The case of the fireman is interesting at this time in view of the large number of cases of blindness reported due to shell shock. Here was a strong man, a member of a hard working class in whom one would not expect hysteric manifestations, with no neurotic tendencies so far as we know, who received a fall, but not hard enough to cause an incapacity. He was badly frightened, however, and no doubt there was considerable of a psychic shock at the time of his narrow escape.

Just what force it is that disorganizes temporarily the nervous pathway to the brain, we do not know. Neither do we know at what point the block occurs. In the reports we are getting from the experiences of those who have had opportunity to study shell shock at first hand, are cited cases of men who are knocked unconscious by the explosion of a shell, remaining so for hours and even days, leaving no bodily mark, and yet these men became instantly blind.

J. Herbert Parsons, in the *Lancet* of April 3, 1915, cites some extremely interesting cases; they become blind, some of them having blepharospasm and lacrimation with no sign of foreign body in the eye. He points out that these men grope their way about, but do not seem to stumble as blind men do. Taste, smell and hearing are usually partially or totally absent in these cases. But why is it that the eye rather than the ear, for instance, should receive the brunt of the shock?

Hugh S. Pemberton, writing also in the *Lancet* of May 8, 1915, as well as Parsons, advance the suggestion that one of the causes might be due to the intense flashes of light during the night firing, overstimulating the retina. We know that in the dazzling producing solar retinitis and also in that met with in

oxyacetylene welders, distinct changes in the retina can be seen. Major Burz and Capt. Ormond, writing in the *Lancet* of Jan. 1, 1916, give a series of these cases, as also does Charles Meyers in the *Lancet* of April 3, 1915. They all report the best success in the treatment with hypnotism, which would rather settle the question, that these are cases of hysteria, rather than of organic origin. Burz and Ormond emphasize the point that other methods were ineffective. Ormond states that he was personally prejudiced against the use of hypnotism. Parsons who, by the way, goes into the psychology of these cases in a thorough manner, concludes "though there can be little doubt that the early loss of vision has a neural basis, it must be conceded that in the later stages the neural basis is of that undefined nature which we associate with, so-called functional conditions. In other words, it is neurotic, but is not "shamming," difficult though the line is to draw between them. . . ."

I wish to advance this idea more for the purpose of discussion than anything. The fact that sight, taste, smell and hearing are all affected in those cases, would indicate that the block affects the higher centers somewhere. Parsons says, "the higher level cortical cells." Could there not be in addition an extra injury to the nervous structure of the eye, either from the explosive shock causing a commotio retinae, or perhaps an extra effect from the dazzling to explain the greater effect on the eye?

In conclusion we are practically sure of one fact, that where there is a demonstrable lesion in the eye ground, we have an organic disease even though there may be hysteric manifestations present.

DISCUSSION

Dr. J. M. Banister, Omaha: We are indebted to Dr. Teal for a most interesting paper. We do not need to pay much attention to the first case presented as, while very interesting, it was essentially a case of syphilis, and would fall into the luetic class.

The second referred to by the essayist would seem to be essentially an instance of hysteric amblyopia. Her amblyopia was evidently the result of distress and anxiety on account of her fiancé's absence as a soldier in Europe. The speedy recovery of her vision after his return points unmistakably to a psychic condition.

The case of the railroad man who fell from a rapidly moving engine furnishes a very interesting condition, especially at the present time when so much attention is being given to the pathology of shell-shock, and the amblyopia due thereto. This man, the essayist states, was greatly frightened by the fall, and it is highly probable that in the presence of this fear the psychic blindness came on. The amblyopia resulting from shell-shock, in accordance with the views of the English special observers at the front in Europe, has nearly always been accompanied by the element of

great fear, and in case where there has been no definite ocular lesion, has been considered a psychic manifestation. In the case described by the essayist, the condition would seem to be of this type, especially since a complete recovery of vision resulted.

Dr. Walter Lancaster, Boston: A great deal has been written about the ocular symptoms of hysteria and our knowledge of these symptoms is fairly complete; the contracted fields—which, by the way, must be manifested at the very beginning of the perimetric test, since a similar contraction occurs in neurasthenic patients when the examination of the fields is prolonged; the good orientation in spite of the contracted fields, as shown by the patients moving about without running into and stumbling over things, showing that some sort of vision takes place in the apparently blind periphery of the field; the reversal of the color fields; the predilection for red, so that red is seen better than the other colors, or even white, though white contains red; the areas of local anesthesia of skin or mucous membrane, especially on that half of the body corresponding to the eye with the greater amblyopia or more contracted field; the motor symptoms of ocular hysteria—spastic rather than paralytic, e. g., spastic convergence causing internal strabismus, spasm of the orbicularis causing ptosis, which differs from true paralytic ptosis in that the brow is not elevated by the frontalis trying to open the eye, but is drawn down.

Why, then, is the diagnosis of hysteria so often baffling? It is not simply because it must be largely made by exclusion, since it must be shown that no adequate ocular disease exists to produce the symptoms. Is it not because the diagnosis has to rest not on the ocular symptoms, but on the way the ocular symptoms are accounted for, that is, on the *nature* of the disturbance from which the patient is suffering and which manifests itself in certain ocular symptoms *but also in other ways?*

There is something more needed to make a positive diagnosis of hysteria than the presence of more or less isolated symptoms, such as amblyopia, without discoverable organic cause; moreover, hysteria may exist even in the presence of organic lesions adequate to produce many of the symptoms, as in the case on Dr. Teal's list.

In short, my plea is that a better understanding of the *nature* of hysteria will help tremendously in elucidating ocular symptoms suspected of being hysteric but about which there is uncertainty.

Now those who have been working at this problem for the past twenty-five years are the neuro-psychiatrists, and they have thrown a flood of light on the nature of hysteria and have, as it seems to me, answered some of the questions raised by Dr. Teal.

He says: "Just what force it is that disorganizes, temporarily, the nervous pathway to the brain, we do not know. Neither do we know at what point the block occurs." And again, speaking of blindness following shell explosion: "But why is it that the eye rather than the ear should receive the brunt of the explosive shock?"

Let us take a few simple cases. A soldier who has had several weeks service at the front, has seen wounds, suffering and death, has suffered with cold or heat, hunger and lack of sleep so that he is pretty thoroughly fatigued, finally is standing by when a high explosive shell falls amid a group of his intimate comrades, killing some and horribly mangling others. He himself does not receive a scratch, but is struck blind. We examine

his eyes and find his media, retina, optic nerves, pupils all show absolutely nothing to account for it, and we say he was not wounded. Yet it is hardly a far-fetched figure of speech to say that he has suffered a most severe wound. He has seen a sight which was literally more than he could bear. His *consciousness* has had a wound inflicted on it of staggering severity. His eyes continue to see, but as a defense reaction, the sensation is cut off from his consciousness and he has not the slightest idea what the explanation of his blindness is.

Again, a man passes a night of anguish, hearing wounded comrades in No Man's Land, groaning and crying for help while he and all others are forbidden to expose themselves in any attempt at rescue or relief. The morning finds him deaf, as a defense reaction against a situation which has become intolerable to him. The ability to hear is repressed or inhibited, so that, although his ears are normal, the sensation of sound does not reach his consciousness.

In all such cases the action of the patient is a defense reaction taken to escape an intolerable situation.

A muskrat caught in a trap reacts by gnawing off his leg above the trap and so escaping an intolerable situation. A man in some situation involving his arm, for instance the prospect of having to use it to hold a rifle and draw a trigger under circumstances which have become to him intolerable, reacts not by actually severing his arm from his body, but by so severing its connection with his consciousness that he is unable voluntarily to move it—it is paralyzed.

These are very simple and plain cases, but the neuro-psychiatrists are able to elucidate and explain the more obscure cases of hysteria on similar lines. The patient is often the last to suspect the nature of the trouble because the repression or inhibition takes place not on the level of conscious mental activity, but on a level below called the "fore-conscious."

Our mental life is on three planes or levels: the conscious, the unconscious, and an intermediate called the "fore-conscious" level. The unconscious is largely made up of instinctive forces. An instinct urges towards a certain more or less specific type of action without regard to time or place. There is no inhibition, no negation, no conflict in the unconscious. A dog seeing a bitch in heat proceeds to mount her, regardless of time or place, and were it not for inhibitions and repressing forces exerted by other levels than the unconscious instinct, the human animal would act in the same way.

Now the inhibitions which are most effective are not, as might be thought, those of the highest level of conscious mental activity, but are those of the level called the fore-conscious. Here reside the controlling forces derived from education, morality, culture, judgment, reason. The unconscious comprises all that belongs to the primitive man; the fore-conscious belongs to civilization.

I wish I had time to show you how these repressions which are so large and important a part of education and civilization, are at bottom reactions to escape pain or painful experiences, or injuries to our self-esteem, etc. The nature of the repression which results in hysteric symptoms is essentially the same. It acts on the level of the fore-conscious and the patient is entirely ignorant of what is going on. I lack the time and knowledge necessary to make clear how morbid inhibitions and repressions produce the symptom complex of hysteria.

What I am trying to do is to point out that here is an important field for us to study if we wish to really understand the nature of hysteria, and second, that unless we understand the nature and mode of genesis of hysteria, we are greatly handicapped in both diagnosis and treatment. We must call to our aid those neuro-psychiatrists who are expert in these matters, but are not so carried away with it as to lack the level-headed judgment which is indispensable in treating a hysteric patient above all others.

Lastly, I wish to show that there is a close relationship between hysteria and malingering and that we shall be aided very much in differentiating them by acquiring a grasp of the psychology of the unconscious and the modern theories of hysteria.

The hysteric reacts to an intolerable situation by an adjustment which is *unconscious*. With the malingerer the intolerable situation and his reaction to it are both on the level of consciousness. He knows what he is doing and deliberately deceives. The hysteric has no idea that it is because he is executing a defence reaction to an intolerable situation that he manifests his symptoms.

Dr. H. B. Young, Burlington, Iowa: There was a time when the diagnosis of tubercular meningitis was on the same plane as that of hysteric amblyopia, namely: Death in every case marked the one; recovery in every case, the other. But the derivation of the word, hysteric, should have more consideration in these cases; for sex will almost surely be found a dominant factor.

Something less than two years ago, on one of the coldest days of winter, and at the request of a colleague in an adjoining city, a man brought his seventeen-year-old daughter to consult me about a mysterious monocular blindness. The point at issue was: retinal lesion or amblopia? My colleague, reinforced by the findings of an internist, that the somatic functions were normal, was disposed to exclude the latter, although admitting uncertainty about retinal changes, and inability to locate any focal infection. To me the two retinae were identical in appearance. I also found sufficient vision to allow a field test, normal for form, uncertain for color, but not really reversed. The girl was very reticent; but as she was voluptuously developed, wore a short skirt, exposing diaphanous silk hose, and had the front of her waist cut low enough to expose the top of her breasts, I wrote my colleague to spell her sex in capitals and apply the word "blind" to her father. Recovery as usual.

Dr. E. B. Heckel, Pittsburgh: The use of the word "hysteric" is unfortunate, as it leaves a false and bad impression. I would suggest that we substitute the term "phychic amblyopia" and "psychic amaurosis."

Dr. Walter Parker, Detroit: One clinical point: I was in a position where I could investigate fifty cases where the diagnosis of hysteria had been made by others. Examination showed that 50 per cent were dyspneics. The rest had contracted fields. I thought it an important clinical discovery, but I am now convinced that it is pathognomonic of hysteria. By suggestion you can get almost any field you want. It is interesting to have the field taken by four or five competent observers and compared with the fields you get. It is certainly the most definite field symptom.

I think the author had made a good point of cerebral syphilis in his

first case history. I have come to think we can make a good differentiation between hysteria and central tumor and simulated hysteria. I think we now lean the other way. Until we eliminate that we say nothing about the other. We try to suggest the central lesion.

Dr. A. G. Bennett, Buffalo, N. Y.: In a case I saw the question of sex is eliminated. A little boy of six, a neurotic, the son of a neurotic father, a marked epileptic. The State requires that every school child shall be vaccinated. He was brought to me by the mother, who complained he had been poisoned by the vaccination. It had not taken, though I think it was done ten days before. He had complete external and internal ophthalmoplegia. His eyes were set as though in plaster. His accommodation was gone absolutely. After trying several things for several days, I came to the conclusion it was hysteria; and the method I tried was suggested by Dr. Sherman, who had used it in bed-wetting of children. That was for the mother, after the child was fast asleep, to tell the child it would be better in the morning. In four days he was perfectly well.

Dr. C. W. Hawley, Chicago: When we enter upon a discussion of hysteric amblyopia we get into pretty deep water so that we do not know where the bottom is. I have not much to say about it, but will say that in examining the field as to color, when it will vary with each man's examination, that indicates a hysteric condition. I have examined a field and again in a half hour found it entirely different. I want to call your attention to that because it is suggested in the case of the fireman who fell out of the cab of his engine. There is such a thing as traumatic amblyopia in which you find the same dislocation of color, and that the blue comes inside of the red. The red and the blue in the traumatic cases will be perfectly symmetric, the blue inside red, and in the hysteric cases it will vary greatly, the blue partly inside the red and very irregular.

Several years ago I was called on by the street railway companies to try to get at the difference between the traumatic and hysteric damage cases, and I found it always true that in the traumatic cases the blue and red were regularly contracted, and in the bad cases the blue inside of the red; but in the hysteric cases they were very irregular.

Dr. Allen Greenwood, Boston: We saw a great deal of this type of war neuroses in France, and the hysteric element and the attempt on the part of the individual especially to get away from an intolerable situation was well shown when the majority of the patients promptly recovered after the armistice was signed.

Take a child with hysteric amblyopia and a vision of 20/200. Such a child is trying to escape an intolerable situation at the school and one can, with a little advice to the parent and the child bring him to a recovery.

In the war some would escape the intolerable situation by self-inflicted injuries. This being the outcome of their sudden determination not to go over. They would wound the middle finger, or the fore finger or the foot and I think they should be classed as defectives, who should not have been in the service. I think there are no men who have not, possibly, a limit to the situation which they can stand. We might any of us come up against an intolerable situation, though I doubt not we would most of us stand it pretty well, but sometimes there comes a break and there is an inhibition of the central nerves.

A CASE OF CYSTICERCUS IN THE VITREOUS.

LOUIS F. LOVE, M. D.
PHILADELPHIA, PA.

I desire to report briefly a case of cysticercus in the vitreous seen by me in 1906, and also to exhibit water color drawings of the parasite made by the late Margaretta Washington.

The patient, an American male, aged 50, consulted me for disordered vision, hoping to procure suitable correcting lenses. On discovering the parasite I immediately referred the patient to the late Dr. Herman Knapp, who confirmed the diagnosis absolutely and asserted that it was the first time he had seen a case of this kind in America. He stated further that in a visit to Alfred Graefe, at Halle, the latter had told him that he had operated on more than 60 cases—in fact, he declared that he operated on hydatid cysts almost as often as for glaucoma.

The parasite as seen by me with a plus 16D lens was about 12 to 15 mm. by 8 to 12 mm. in length. At its posterior end it was provided with a bladder-like sac into which it could withdraw at will. This sac contained a hole, which was in reality the oral orifice. When the parasite protruded its head a rounded snout was discernible. This was provided with two rows of hook-like tentacles, which were protruded or retracted as the parasite saw fit. The movements of the worm were very active at times. The cyst was quite translucent.

In Fig. 1 the bladder can be plainly seen with a slight protrusion of the head and tentacles. About one disc diameter from the nerve, up and out, there is a retinal area through which Miss Washington thought the worm had made its exit into the vitreous.

Fig. 2 shows the worm in various positions with its rounded snout and tentacles.

Fig. 3 shows spots of an old chorio-retinitis, and a tunnel in the choroid which was probably caused by the parasite.

Since the eye was giving the patient no trouble he refused operation. The vision was 20/20 at times.

I saw the patient again after a lapse of two years, and he repeated his former statement that the eye was causing him no annoyance. The patient is still alive, although he is in poor health and, so far as I can learn, the eye has remained quiet.

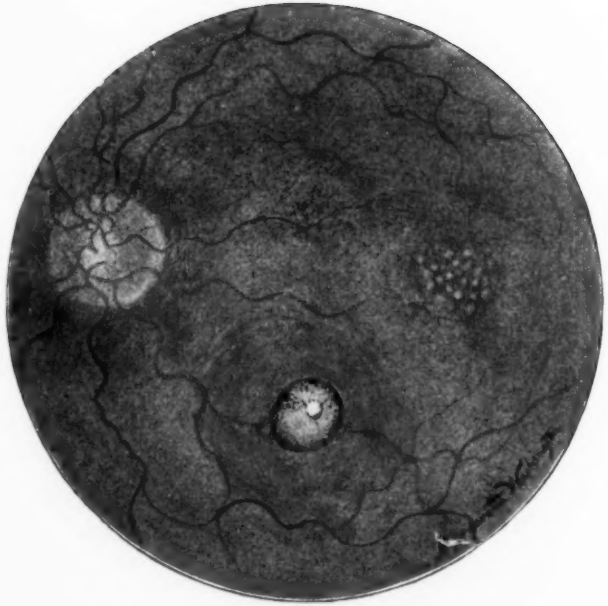


Fig. 1
Showing location of parasite

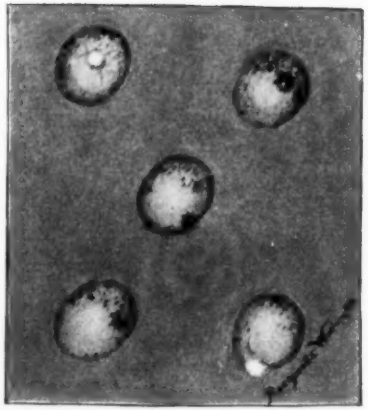


Fig. 2
Various positions of parasite

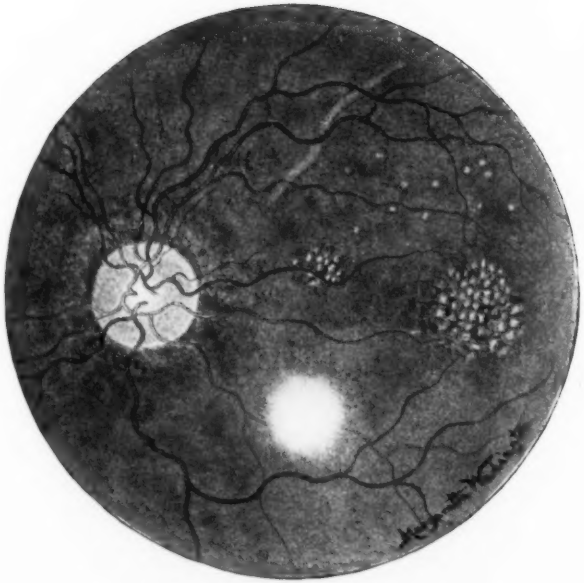


Fig. 3
Old retinochoroiditis

The fact that the eye is giving no trouble is not remarkable, since cysticerci have been known to be imbedded in the vitreous for 27 years without destroying the globe and with fair retention of vision, as was reported by Dr. Cheatham, of Louisville, Ky., at the Pan-American Congress in 1903.

Knapp, in his communication to me, stated that cases of from two to four years' standing are common.

Von Graefe saw a case in 1856, which was seen intact twenty years afterward by Hirschberg. Others have reported cases of long standing in which the vision was nearly perfect.

Cysticercus cellulosa represents the larval stage of tenia solium. The parasite has a quadrangular head, a long cylindric body, and an elliptic caudal vesicle. It is from 10 to 15 mm. in length.

Schmidt-Rimpler, in discussing the condition, remarks that the embryo enters the stomach of the host with the food or water, and loses its covering by the action of the gastric juice. It penetrates the blood vessels by means of its hooks, and begins to migrate. It finally becomes settled, and undergoes the second stage of its development, in which it is known as cysticercus. It is converted into a vesicle filled with fluid contents. All authors agree that the embryo travels with the blood current. Cysticerci may occur in any part of the eye or orbit, lids, conjunctiva, iris, lens, vitreous, choroid and retina. The parasites are found more often in the posterior part of the eyeball than in the anterior.

In northern Germany Graefe saw 80 cases in a total of 80,000 patients, or 1 in 1,000 in the deeper tissues of the eye; 3 in the anterior chamber; 5 beneath the conjunctiva, and 1 in the orbit. Hirschberg, in a period of six months, saw 2,100 new patients, in 5 of which he found cysticercus, or 1 in 420 cases of eye diseases.

A recent case of cysticercus in the vitreous was reported to the Section of Ophthalmology of the American Medical Association, at Atlantic City, June 1919, by G. E. de Schweinitz and Meyer Wiener.

Now as to treatment:

The administration of vermifuges is absolutely without avail. It has been suggested that the cyst containing the embryo be punctured and the life of the worm thus destroyed. Such measures are useless and dangerous, in that they permit the parasite to make further inroads on the partly diseased globe.

The only method from which any result is to be expected lies in the removal of the sac as soon as possible. In the majority of cases, however, the prognosis is unfavorable.

DISCUSSION

Dr. Meyer Wiener, St. Louis: My experience with this rare condition, like that of most of us, has been quite limited. I saw one case in the Charité in the service of Dr. Greef in Berlin, and one case in my own practice at home; and this one with de Schweinitz, which was seen in June at Oglethorpe. According to the pictures shown by Dr. Love this case of ours was much more active than his and took up most of the vitreous body. The entire history was different. In Dr. Love's case the vision was 20/20 and had remained so for many years. Our patient was a young girl, 19 years of age, who ten months before I saw her had good vision. She complained of first noticing a blurring of her vision. She first consulted an ophthalmologist in Chattanooga, who diagnosed it as retinitis. She came to our service at Ft. Oglethorpe and we made a diagnosis from this large sized body and the large neck and head. It seemed to be stimulated into activity especially by the light from the ophthalmoscope and all that was needed was the light to get it to come out and show itself. When I first saw the patient there was no perception of light in this eye. The other eye was normal. Physical examination of the patient was negative, but in the stool we found the eggs of the tape worm.

Regarding the treatment of these cases, I thought we would have a comparatively easy time in removing this in toto or in part; but after making an incision in the sclera and using the ophthalmoscope in one hand and the forceps in the other—and I got a splendid view at all times—when I grasped the neck with the forceps, it was as though one tried to pick up a piece of jelly on the end of the forceps, and I got nothing. You can imagine that sensation of picking up a piece of jelly. That is the same sensation I experienced. The cyst collapsed and we could do nothing further. The eye was removed therefore.

Dr. Clarence Loeb, Chicago: I want to add to the cases reported one I saw about fifteen years ago, when I was associated with Dr. Carl Barck, of St. Louis. On examination, a pulsating vesicle could be seen, which at times elongated itself in one direction or another. On close examination, one or two hooks could be seen. During the operation there was a sudden gush of fluid, and though we could not find the cysticercus in this fluid, subsequent ophthalmoscopic examination showed that it had disappeared from within the eye. I am under the impression that Dr. Barck reported this case, but do not remember where or when his paper was published.

Dr. James M. Patton, Omaha, Neb.: I wish to mention a case that was diagnosed as cysticercus. A young Greek of 18 or 20 consulted us on account of failing vision in the right eye. We found a vesicle in the upper nasal quadrant, but it did not have the ordinary retinal and choroidal attachments. After examining it myself and after consultation with Dr. Gifford, we decided it was a cysticercus in a quiescent state, and the parasite probably dead. We were unable to recover evidence of tape worm in examination of the stools. He gradually developed a full cataract. After removal of the cataract the cyst had disappeared, evidently ruptured during the process of the operation.

Dr. Allen Greenwood, Boston: It will only take a minute to

describe a case I encountered and I mention it because it showed so clearly the movements of the cysticercus.

In this case a mass about 2 D. D. in size was seen just above the macula. On the next day it had moved to below the disc and the next day it nearly covered the disc. On the fourth day it had grown larger and showed very clearly. It had moved about and was growing rapidly. I performed a similar operation to Dr. Wiener's and placed the forceps so they came on each side of the cyst but when they came away there was a gush of fluid and I got no cysticercus, only a portion of the cyst wall.

Dr. John Green, Jr., St. Louis, Mo.: Can Dr. Love, from his survey of the literature, inform me whether any of the operated cases resulted successfully, i. e., with preservation of the globe and some vision?

Dr. Love (closing discussion): In answer to Dr. Green, Dr. Knapp in his communication to me referred to Professor Schwarz in Leipzig and also Czermak in Prague, who go very deeply into the methods of getting the scolex out, which is not an easy task.

Czermak advises to incise the sclerotic from the temporal side as far as the macular region or, if there is not space enough, the osteoplastic removal according to Krönlein.

A WAR CRISIS IN THE ADVANCE OF MEDICINE—ESPECIALLY OF OPHTHALMOLOGY.

LUCIEN HOWE, M. D., F. A. C. S.
BUFFALO

The object of this paper is to show the need in America just now for more original work in all departments of medicine—especially in ophthalmology, and to indicate how that can be made possible, the statement, necessarily brief, will be arranged in condensed form. There are two reasons for presenting the subject before the Academy.

First: Although it is viewed here from the standpoint of the ophthalmologist, it concerns also the otologist, the laryngologist—indeed, every practitioner of medicine—and,

Second: The sooner that this, and other groups of physicians begin to consider the subject, and to present its claims in a manner to be shown later, the sooner will some action be taken.

It is practically an axiom that the degree of progress in medical science is in proportion to the amount of investigation by modern laboratory methods. But such research is now and always has been comparatively rare in America, as compared with the amount accomplished in the leading European countries. The reasons for this are:

(A) The lack of opportunity. We have not a single large and well equipped ophthalmic laboratory in the United States. For that purpose and, indeed, for most forms of medical research, four requisites are essential, namely:

(a) A library as complete as possible, in which the student can find a bibliography of his subject or complete one for himself. A vast amount of time and energy is annually wasted by those who do not first ascertain what others have done, but instead plod wearily over ground familiar to many earlier students, and make no progress in the end.

(b) The second desideratum, and a most important one, is a competent Director to advise the student as to his plan of study—what to do and how to do it.

(c) Next, abundant apparatus, already adapted or adaptable to the purposes of the investigation.

This does not mean the usual supply of perimeters, phorometers or the like. It means the more rare instruments, like the

phacometer of Tscherning, for observing changes in the lens during accommodation, appliances for photographing the rapidity of ocular movements or for photographing the fundus, and others of that grade.

In affiliation with a workshop of optics and physics there should be the other laboratories, common to all medical schools, for the study of pathology, bacteriology, biochemistry and other allied branches.

(d) The most important and absolutely essential adjunct of an ophthalmic laboratory is an eye clinic or hospital large enough to furnish plenty of patients for intensive study and treatment.

Such is the equipment we should keep in mind as the ideal for laboratory research. But apparently it does not exist as yet in America.

(B) Lack of definite aim is another cause of indifference toward research. This lack is partly the result of the general indifference to original work, but especially of the lack of some immediate incentive to study a certain subject. All except the very ignorant among us appreciate our own ignorance. But the question is what subject to choose, where to begin, what to do and how to do it. Like grown-up children, many of us are in need of an impelling and directing force to start any kind of investigation. This direction and inspiration could be supplied best if we had some central committee or government department to point out the path and offer inducements to pursue it.

(C) Another cause, and probably the most important of all, is the temptation to the professional man in America to build up a lucrative and fashionable practice. Of course, the support of our families is necessary and the acquirement of a competence is a laudable ambition. But, unfortunately, in this country the doctor especially is too often estimated not by his attainments, but by the wealth he has acquired. During the last century and a half, or less, we have been building a continent, and grown from small beginnings to one of the leading powers of the world. But now it behooves each one to rise above commercialism and give back to his profession at least a little of what that profession has given to him. Each must settle that account with his own conscience.

II. Opportunities for study have suddenly lessened, especially in Central Europe and somewhat in England, France and Italy. Any reference to Germany usually arouses immediate antagonism. I am far from being an admirer of her supposed

Kultur, and remember well the recent excellent article by Jackson, showing that many of her supposed discoveries in ophthalmology were really American. But, in spite of that, we must look at two facts, which are:

(A) The destruction of opportunities abroad. For years American medical students, especially ophthalmologists, have gone to German laboratories for research work. Now conditions are changed.

Financial conditions especially threaten medical progress. Germany, with Austria and Hungary, have together a debt of about forty billions. Their money now has little or no value. If there remains any doubt of the utter destruction economically of Central Europe it is only necessary to read the conditions of the treaty signed at Versailles on the 23rd of June, especially Part IX, Article 248 to 274. And these conditions are already ratified by four great powers.

Moreover, this danger to medical progress threatens friendly as well as enemy countries, in their legacy from the war of countries (in Europe, in Asia and vast tracts in Africa) to fight for, or govern, or protect. Such responsibilities must divert those nations from culture and research, just as they did America during its first century.

(B) Destructive socialism in America is inimical to the practice of medicine. Last year a bill almost became a law in New York which, if enacted, would, by political influence, have robbed our profession of its ideals and degraded it to a trade. New York will hear of that same law again next winter and later other states will.

The general plan of that proposed law is to have practically every person who is a wage earner or who receives a salary insured by the State. In return the State is to furnish medical care and hospital treatment if necessary. The practical working of such a law has been already shown in central Europe and to a certain extent in England. Comparatively few physicians, for the most part with mediocre qualifications, accept the positions of health physician. Each one sees a surprising number of patients, has little or no opportunity to make exact diagnoses, and simply doses out medicines by wholesale. The honest student of medicine, thus deprived of practice and of income, loses interest in his work, and naturally does not care for research.

A destructive socialism which provides imperfect relief to those already ill is quite different, as we shall see, from a form of constructive socialism which, under government direction, en-

courages medical research and prevents disease in all generations to come.

Here, then, we have this War Crisis in the Advance of Medicine.

We know that laboratory research is necessary for the advancement of our science, and some of the reasons why it is comparatively rare in America; also that opportunities for study have been lessened, especially as the result of the war.

III. What can be done? Let each practitioner take these facts to himself. During the war, every man was ready to do his bit. Why not now in peace? But how?

(A) Let each one bestir himself to undertake the study of some question, no matter how small. Some new fact, some new instrument, something of some sort, each one should contribute to this melting pot of ideas.

(B) Medical students should be taught to investigate. The plan of preparing a thesis, still extant abroad, has unfortunately been neglected here. One of its great advantages is that it shows the student how to begin reasearch by finding what work others have done in the same field. It introduces him to the Year-Books, to the Index Medicus, to Nagel's Jahresbricht, to similar indexes or journals or textbooks in different languages. It prevents him from wasting energy on what we already know. It is his first lesson in medical sloyd.

(C) Young practitioners should be enlisted by their older colleagues in research work for patients.

(D) A propaganda should be inaugurated by the medical profession, especially by ophthalmologists, for the promotion of medical investigation. This can be done:

(a) By individual effort in spreading the gospel among intelligent patients and other interested persons with whom he comes in contact, and

(b) By cooperation. Harvard, Yale and other institutions have each begun a "drive" for additions to their general funds, and medical education should be included. Various institutions in New York have combined in the New York Association for Medical Education. It is said they hope to raise ten millions to help make that city one of the great medical centers of the world.

A munificent gift by Rockefeller, stated to be about fifty millions, has recently been announced by the press. In view of the magnificent scientific work already accomplished by the Rocke-

feller Institute it is safe to say that any additional amount will be wisely spent.

These superb examples of generosity are indications that at least a few individuals have already been stimulated to do what is possible to meet the present crisis.

But we should remember that these are only isolated efforts in a few cities, in a country of more than a hundred million people.

The important fact is that individual efforts, no matter if they are assisted by large endowments, are not sufficient to produce the best results. Such efforts are spasmodic and scattered. The great need of research in this and in every other country is cooperative effort.

An illustration will show what is meant. Formerly each astronomer made his own observations independently. But later they all agreed that each should make observations of a certain kind, in a certain part of the heavens. The result was systematic effort and vastly better results. A similar problem in regard to medical research should be solved in a similar way.

This brings us to the final and most important part.

IV. How can the various forms of medical research in different localities be coordinated and thus made more efficient? It is only possible here to sketch the outline of a plan which has been long under consideration.

First of all, we should have in this country a Department of Public Health, its head being a member of the Cabinet.

For many years it has been the aim of the American Medical Association to bring that to pass, but thus far the contentions of 'pathies and influence of patent medicine manufacturers have been sufficient to defeat its efforts. It has been said many times and probably with truth, that more money is expended in preventing diseases in the cow, hog and other animals, than for the preservation of the health of human beings. However that may be, it seems high time that more effort and wealth should be expended for the prevention of diseases, of blindness, and for the saving of human lives. The establishment of a central Public Health Department would not be either difficult or in any degree a sudden change. The powers of the General in charge of the Public Health Service have been gradually enlarged, and the work done by that office has been so efficient and so useful, that it would meet the approval of the medical profession and of the vast majority of intelligent citizens to change that Bureau into a Department. The personnel would be the same, only with a staff enlarged enough to meet the increased demands

upon it. The duties of that office would be to receive suggestions from sections of the American Medical Association, or from other such sources, to determine which problems seem in most urgent need of cooperative research, to formulate definite plans for their study and seek out the workers in that field.

This does not mean the establishment of a large medical laboratory at Washington or in any city. That would be unnecessary expense and duplication of effort. The object would be to stimulate and encourage research, especially among those just entering the profession, to standardize the method and the quality of such work, and to fit into each other the many fragments of investigation which are constantly being produced in different parts of this, and of every other country.

The practical working of such a plan would be about like this: Suppose, for example, the section on ophthalmology of the American Medical Association, at some annual meeting, should ask the Department of Public Health to investigate the ultimate causes and prevention of interstitial keratitis. That request, following the usual routine, would pass from the section on ophthalmology to the Council of the Association. If approved by the Council it would be recommended to the Chief of the Department of Public Health Service. Although not obliged to act upon the recommendation, it would probably be done as soon as feasible.

In that case, the chief would call to his aid some ophthalmologist in that Department who was thoroughly acquainted with workers in his branch throughout the country. It would be comparatively easy to enlist the cooperation of those who had already studied the subject, and who were fortunately located near such ophthalmic laboratories as exist.

The different factors in the problem would be assigned to different groups in different laboratories. It is safe to say that some thus invited to take part in the investigation would do so without expectation of pecuniary reward. Most of the younger men would have to be paid from Government funds, but only enough for their support, about what would amount to a fellowship. But they would give their entire time to the subject. Perhaps three or four experts altogether, in genetics and in laboratory technic, would each be paid the average remuneration of a professor.

The economy of this will be referred to later. The important fact is that the separate groups would be working at the same problem at the same time, each with the knowledge of what

the other was doing, and, with cooperation through the central office at Washington, more progress would be made in one year by such a method than could in many by disjointed effort.

The study of interstitial keratitis was suggested by the recollection of a boy who came under my observation some years ago. In spite of every effort this young fellow became blind in both eyes, then almost totally deaf, then insane, and later died in an asylum. If study of this subject could show the reasons for such results—perhaps whether the marriage of parents like his should be prohibited, the gain to humanity would be immeasurable.

Objections might be raised to this plan for a Public Health Department because of its cost. Undoubtedly some additional expense would be involved. But let us look at the other side of the account, confining ourselves to the field of ophthalmology.

According to the recent exhaustive treatise on "The Blind," by Best, they require in the United States alone "the direct expenditure annually of some six million dollars, and an indirect cost of possibly over sixteen million, with perhaps a total economic loss of thirty-one million."

If the discoveries at such a laboratory resulted in a decrease of blindness of even a fraction of one per cent each year it would pay for itself many times over.

Even the imperfect account here given of the present war crisis in medicine indicates quite clearly that such a plan as is here suggested would tend to remove the three principal causes for the lack of medical research in the United States. Ophthalmology and other branches of medicine would not then be in danger of degeneration. America would come to the rescue, and ensure to the world less blindness, better health and longer life.

DISCUSSION

DR. R. H. T. MANN, Texarkana, Texas: I have thought a great many times of just how we were to meet this emergency. How are the funds to be provided for us to take the place of Germany and Austria in the establishment of great research laboratories, which will be such a benefit to the medical profession and to the public as well. America has to do it, there is no question about that. America is the only country which can do it. America can never do it by the use of funds from Mr. Rockefeller, because these funds will be inadequate. This emergency will have to be met by our Government, and when we impress the Government with the importance of this great work we will be far on the road to success. Some of our congressmen and senators already realize the importance of this work, for a United States senator said to me recently that we are losing more lives each year from preventable diseases than we did in the great war. The way to do this is to get the National Government under it and to convince them that money invested in this way is the best way that it can be spent, using it in the saving of lives.

THE REMOVAL OF MAGNETIC FOREIGN BODIES FROM THE VITREOUS.

LEE MASTEN FRANCIS, M. D.
BUFFALO, N. Y.

The purpose of this paper is to formulate, if possible, some definite plan by which one may be guided in selecting a method and route in the extraction of magnetic foreign bodies from the vitreous body, to set forth the intimate technic of the procedure and in so doing bring out certain details not usually considered or assumed as being understood. It is not claimed that any of this is new or original, but in as much as surgical perfection is approached by the improvement of details, it is hoped that some of the steps may be helpful to others: more especially that the presentation of this subject will stimulate a discussion, which will bring to the surface improvements in method which individual experience has proven useful.

It is assumed that the penetrating body has not carried with it infection and the discussion deals with eyeballs, which are in a fair way to be saved after the removal of the foreign substance.

Diagnosis: Experience has repeatedly shown that the absence of a visible avenue of entrance is a thoroughly unreliable guide in the diagnosis of the presence of a foreign body in the globe, nor if present, does the apparent path through the media, furnish reliable information as to its ultimate location, unless, of course, the body is plainly visible to the ophthalmoscope. In a similar way, the history is totally to be disregarded. I deprecate the use of the giant magnet as a means of diagnosis. The exposure of an eyeball to the giant magnet without previous knowledge as to the size, location and position of the entering body, may do infinite and irreparable harm. Enough information cannot be gained to warrant the practice.

The final diagnosis must rest with the roentgenologist and to the roentgenologist the suspected case should be sent promptly. How many exposures should be made? There is no set number, but enough to establish, not only the definite localization of the particle, but what is of equal importance, *its several dimensions.*

It is quite obvious that photographs exposed in two planes only (as is usually done), cannot provide this information—always three and sometimes four are needed. Too much emphasis cannot be placed upon the necessity of knowing the three dimensions, for upon this knowledge must rest the rational selection of the method and route to be chosen for its extraction.

Route and Method: In the selection of the route and method of extraction, the surgeon should be governed solely by the location, shape and size of the foreign body.

Size and Shape: It is obviously very difficult to lay down didactic rules for the selection of the best route and method for all cases. However, a rationale may be indicated. That method and route should be selected, which shall produce the minimum of damage to essential ocular structures, and be most likely free from deleterious aftermath. If the invading body is small, roundish and presents no ragged edges, which may become entangled in the wound or ciliary structures in processes of delivery, the anterior route by means of the giant magnet presents the least surgical risk. If, on the other hand, the foreign body is rectangular, though smooth, and too long to pass through the suspensory ligament, posterior chamber and pupil, the scleral route is the one offering least risk. If the foreign body, though small, presents ragged, irregular notches and facets which are likely to entangle and damage the structures through which it must pass to effect delivery, here again, the posterior route is the one of election.

Location: Whatever the size and shape of the foreign body, if lying against the ciliary body in such a position that there is likelihood of its becoming impacted in the ciliary body upon exposure to the tractive force of a powerful magnet, this fact alone should urge the selection of the posterior route.

To summarize: The posterior route is preferable as offering the minimum of risk in all cases except those of small smooth foreign bodies not lying against the ciliary body.

OPERATIVE PROCEDURE

General considerations: The patient should be prepared as for any major, ocular surgical operation. This includes trimming of the eye lashes and wrapping the head in a sterile covering, preferably moist to prevent slipping. Both magnets should be covered with sterile jackets. For the giant magnet, a pillow slip with one corner cut out does well enough. This permits the

operator to tilt and direct the magnet. A towel suffices for the hand magnet. These coverings should be secured by safety pins or tapes. The various magnet tips should be boiled or effectively sterilized. The magnets should be provided with a rheostat switch directly under the operator's control.

Instruments: A nonmagnetic speculum is essential for both routes. For the posterior route two nonmagnetic forceps, and two nonmagnetic mosquito hemostats are necessary. Nothing is more awkward or disconcerting than to have the instruments fly to the magnet when the current is turned on.

Illumination: Good light is essential. Artificial light, owing to the ease of its control is best—some type of hand lamp so hooded as to illuminate the operative field and not dazzle the operator's eyes and in the hands of an intelligent nurse, is ideal.

Anterior route: Giant and hand magnets.

The pupil having been dilated to its maximum and the eye cocainized, the patient is placed on a stool before the magnet. I prefer to sit facing patient as being the more comfortable position in which to manipulate and observe. Either the magnet is tilted or the patient's head is turned so as to cause traction in the line indicated by the radiograph. The patient is slowly brought nearer the magnet. As soon as the foreign body has passed through the suspensory ligament and its presence in the posterior chamber is evidenced by the budging of the iris, the direction of magnetic pull must be immediately changed to one of obliquity so as to attract the fragment through the pupil. Continued exposure in the first position may impact the metal in the iris. When the foreign body has passed into the anterior chamber, the patient is removed to the operating table to complete the extraction by means of the hand magnet. By means of this magnet, the fragment is attracted to the upper quadrant of the anterior chamber near the contemplated incision. It is a mistake to draw the foreign body deep into the angle, out of sight, but it should be left near the base of the iris where plainly seen. From now on, it should be the chief aim of the surgeon to preserve the *aqueous as long as possible*. The anterior chamber is now opened with a keratome, promptly and in such a way as not to drain the aqueous. The keratome incision should not be at the level of the iris root, but well above it, and directed nearly perpendicularly through the cornea in the direction of the fragment. The magnet tip is then applied to and not introduced into the wound. The assistant stands with the scissors ready to clip the iris should it through some mishap present. If the aqueous has been preserved, the

fragment will glide promptly to the incision, where it can be delivered by the assistance of a fine forceps, should the magnetic force be insufficient.

Posterior or scleral route with hand magnet: The patient is placed on the operating table after the usual preparation made for any operation. The magnet is within ready access when needed. In addition to the usual anesthesia obtained by the instillation of cocain, a subconjunctical injection of a 1 per cent cocain and adrenalin solution is made at the site of the contemplated scleral opening. This insures, not only good anesthesia, but a bloodless field. This incision should be planned to be made as near the foreign body as practicable, bearing in mind the avoidance of the ciliary body, the insertions of the recti muscles and in the lower quadrants rather than the upper. The bleb raised by the hypodermic is now seized with the forceps and a deep cut made in an anteroposterior direction, with a bold stroke of the scissors. This cut includes conjunctiva, and subconjunctival tissue, exposing the sclera. The two flaps are now undermined for ten or more millimeters in either direction. A double armed suture is now placed in the center of each flap margin, incorporating a firm anchorage. These sutures are now secured by mosquito hemostats and are used as retractors. The sclera is sponged free from hemorrhage and an incision is made through the sclera with a sharp well pointed von Graefe knife. The incision should be adequate for the delivery of the foreign body and in the direction of the retinal vessels, anteroposterior. The magnet is then presented to the wound. Meantime, the assistant stands ready with the scissors to trim away the choroid should it present. Upon the delivery of the foreign body, the wound is promptly closed by tucking one flap under the other and covering the first by the remaining flap, in such a way as to utilize the flaps as tractors approximating the lips of the scleral wound, and at the same time seal and reinforce the wound by a double layer of conjunctiva. This flap was described by me in 1913 in a paper before the section on Ophthalmology—American Medical Association.

A further word concerning the conjunctival flap as described above. An important step in the technic is the provision made for closing the wound *before* making the scleral incision. This minimizes the danger of prolapse of vitreous through unnecessary manipulation with an open vitreous wound. In addition to this, the flaps furnish splendid retractors, making the exposure of the scleral wound sure and certain without the necessity of retraction of the conjunctiva by forceps, thereby cluttering up an oper-

ative field already too small. In many instances when not able to have trained assistance, I have allowed the weight of the hemostrats to retract the wound lips. With this in mind, it is well to have the threads long enough to permit the hemostats to hang over the patient's face.

These wounds, in my experience, heal kindly and promptly. I have never seen a gaping scar or bulging cicatrix.

The after care of these patients requires no especial comment. As a routine, they are given sodium salicylat, 40 grains daily for a few days. The sutures are removed in six to eight days.

CONCLUSION.

Unreliability of Case Reports and Statistics: One naturally turns to reported cases and statistics in seeking guidance for the selection of a satisfactory method for the removal of foreign bodies from the globe. I voice my personal opinion upon the value of such data by saying that they seem quite unreliable unless col'aborated from cases which are similar in essential respects as to size, shape and position of the foreign bodies and also to the amount of damage done upon entering the globe and the reaction they excite. The choice of an operative route seems more rationally to rest upon the selection of a method which will produce the smal'est surgical trauma and do the least damage to essential structures. This, in turn, must depend, not upon a fixed procedure, but a procedure best adapted to the case in hand. I cannot be convinced that it is wisdom to drag an irregularly shaped ragged piece of steel, around the lens and through the pupil and, on the other hand, I believe there is a minimum of risk involved by using this route for a small smooth fragment.

The purpose of this paper has been well served, if it has succeeded in pointing out some of the more essential points of technic, not frequently referred to, and has insisted that a given case should be weighed and estimated before the selection of an operative route or method.

DISCUSSION

DR. E. C. ELLETT, Memphis, Tenn.: I hesitate to open this discussion on account of a very limited experience with cases of foreign body. Since many here may have the same disadvantage in deciding what to do in a given case, the lessons from even a small experience may have some value.

Nearly twenty years ago I treated a lady who had a small metallic foreign body enter the eye, pass through the lens and lodge in the retina. It was removed with a small magnet through a scleral incision; the lens did not become opaque and she still has 20/20 in that eye. I think to have

drawn that foreign body back through the anterior chamber might have wounded the lens and the iris and secured a less satisfactory result.

Many of us do not have a satisfactory giant magnet available, but we all probably have access to a small magnet. With all the apparatus and with experience in the use of this formidable weapon, its good qualities cannot be denied; but with instruments of more moderate power, a foreign body cannot be pulled through the anterior chamber unless it is of such size that its passage is attended with the possibilities of very great damage to the eye.

The matter of localization of the foreign body by the X-Ray is of greatest importance. No doubt we have all suffered from faulty reports in this regard, and given a localization by an amateur roentgenologist, an attempt at extraction of an intraocular foreign body becomes a disastrous thing. With a sufficiently powerful magnet and other favorable conditions, the foreign body may be drawn into view, but when it is in the anterior chamber and often entangled in the iris, its removal is often very difficult. With small foreign bodies, accurately localized, my own experience is in favor of the small magnet and the scleral incision.

I have used with much satisfaction, Dr. Francis' ingenious method of closing the conjunctiva over the wound.

Dr. E. L. Jones, Cumberland, Md.: I have had a good deal to say about massive cyanid injections in deep and penetrating wounds of the eyeball. The greatest danger of these things is sepsis. We all know that lymph is Nature's bactericide. I will show you the amount of lymph which is produced by an injection of cyanid of mercury (exhibits two bottles of coagulated lymph). Each one of these bottles represents the washing out of a pad that was on the eye twenty-four hours. You can see from the enormous amount of lymph why you get these wounds restored, and in case of the foreign body not being removed it will take care of them even without inflammatory or degenerative reaction, in a large percentage of cases.

Dr. E. B. Heckel, Pittsburgh: I express my appreciation for the paper because I feel it teems with good things, good sense and good judgment. One thing we should not lose sight of is that the eyeball with a foreign body in it, practically speaking, is not only a blind eye but a lost eye. In regard to the giant magnet as a diagnostic agent I want to say as I did in Pittsburgh that it is not proper. It is foolish to guess when it is possible to know. The x-ray gives a positive diagnosis. In the large cities this is no trouble, and our practice is not to tamper with an eye; pay no attenton to the history, because the foreign body may not be there at all. Have them keep it clean and have it x-rayed.

The anterior route I have absolutely abandoned. I think the best practice is to take the shortest possible route. Foreign bodies, the result of flying pieces, are always angular and sometimes there are several sharp points. So it seems to me always risky in trying to take it out by the anterior way. When the current is turned on I think no man is quick enough to judge when to turn it off in an eyeball of an inch depth. I have abandoned the giant and I use the hand magnet.

As to handling these cases, we should give the same attention as to a cataract so far as sepsis is concerned. It means the opening of the eyeball, which to the patient may be of grave importance. I have a hand magnet with a removable core. When the current is turned on it jumps into place and I know it is working. In the process of using the magnet you can pull the core out and see if it responds.

Dr. Allen Greenwood: I am interested because Dr. Francis has embodied my views to a large extent. In the case of a foreign body in the

vitreous it can be drawn to the scleral opening with the giant magnet and then brought out with the hand magnet. When I have failed to get the foreign body with the hand magnet I have used the giant magnet to place the foreign body where it will answer to the pull of the other. I shall always believe that in times of military stress the giant magnet is of wonderful use. One can make the diagnosis and remove the foreign body on the spot, often without added damage to the eye. Sometimes one has patients in evacuation hospitals where they must remain and where one cannot get them x-rayed satisfactorily. In such cases the large magnet that can be hung on the arm, such as Dr. Lancaster devised, is of great use. In civilian life its use is limited.

Dr. Patton, Omaha: In regard to the difficulties in securing competent x-ray localizations in small cities, I have found that the x-ray men are, as a rule, earnest, scientific, cooperative gentlemen, and if we will assist them they are perfectly willing to learn the localizing methods. As it is difficult to understand the technic of this procedure, several years ago I placed foreign bodies in the enucleated eyes of animals and had them fixed in position in the orbits of a skull and our x-ray man worked out his technic until he became efficient in this localizing work. With your cooperation, I am sure your local roentgenologist will be glad to do as much for you and thus add greatly to your efficiency in handling these cases.

I agree with the gentlemen with regard to the danger of using the giant magnet for diagnostic work. Unless the foreign body has caused so much trauma by its entrance that the wound is sufficiently large so that you can remove it through the wound without further damage, the magnet should be used with the greatest care. The patient is entitled to our utmost skill, and unless we recover the foreign body, the eye is not only lost, but may become a menace to the other.

Dr. C. W. Hawley, Chicago: I want to give an instance to show how tolerant the eye can be to foreign bodies back of the center of the globe. I had the honor of being the first to remove a piece of steel that had been in the vitreous nearly a year, with perfect success and 20/20 vision. I always prefer the posterior route. I make just as small an incision as possible in the sclera and under a conjunctival flap. I entered the magnet seven times in the vitreous before I succeeded in getting it, and in three weeks he was back at work. The peculiarity that I would call attention to is that when you start to remove the magnet the piece of steel slips crosswise and is caught on the edges of the wound, but by removing it rapidly the heavy vitreous keeps the piece endwise if so engaged. Remove it rapidly, because it will always turn on the magnet if it comes slowly.

Dr. F. Park Lewis, Buffalo: After a foreign body is gotten into the anterior chamber it very greatly complicates the case if it is allowed to slip behind the iris again. It easily then becomes entangled in the iris fibres and serious complications may ensue.

Dr. Francis (closing discussion): I want to express my admiration for Dr. Jones' tear vases which I think very original. I wonder if that is tears or lymph. I agree with Dr. Jones and have demonstrated the value of bichlorid of mercury subconjunctivally. I agree with Dr. Patton that not many are competent to take x-ray pictures that can be developed to the point of making a satisfactory diagnosis and location in these wounds. I thank you very much for the interesting discussion.

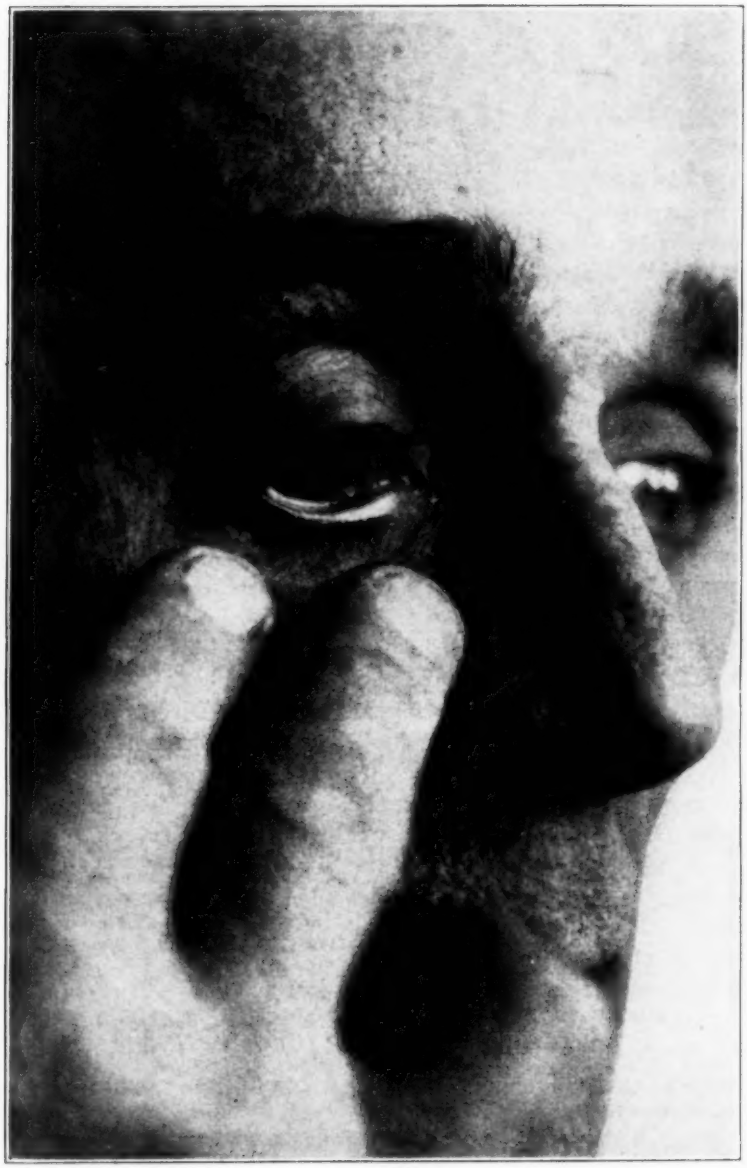
THE CORRECTION OF SYMBLEPHARON BY THE USE OF MUCOUS GRAFTS.

GEORGE B. JOBSON, M. D.
FRANKLIN, PA.

The technic of the operation which I am about to describe, finds its best application in extensive posterior symblepharon, and total symblepharon of the lower lid. Cases of posterior symblepharon of minor degree, and those classed as anterior symblepharon, may be relieved by simpler means.

While no originality is claimed for the method, it may be said to be a modification of that of Weeks, and has been used by me for a period of ten years, with considerable success in a number of cases of men, whose eyes were injured by what is known to the employees in the oil refineries as "sludge." This is a highly caustic product, resulting from treating crude oil with strong acids and strong alkalis. In some instances the acids and alkalis themselves caused the injury.

Technic of the operation: If the patient is seen before the formation of cicatricial tissue, the denuded surfaces of lid and eyeball must be cared for until sloughing has ceased, and granulation commenced. This is the most favorable stage for treating these injuries, and I use the same method as will be described in the treatment of symblepharon. If cicatrization has progressed to the extent of attaching a considerable part, or all of the inner surface of the lid to the eyeball, the symblepharon thus formed is carefully dissected from the lid margin to the bony orbital rim; care being taken to keep the lid as near its normal thickness as possible, to preserve its elasticity. Too much stress cannot be laid upon the necessity of deepening the culdesac to the orbital margin; for failure to do so, will no doubt result in an unsuccessful operation, as the scar tissue in the fornix will push upward, and obliterate the artificial culdesac. If the symblepharon is extensive, it is advisable to perform an external canthotomy, which should be repaired at the completion of the attachment of the graft. All scar tissue must be removed from the fornix and eyeball. And if any healthy conjunctiva remains from the symblepharon, this should be freed, and drawn down over as much of the denuded surface of the eyeball as it will cover, and at-



Oil refinery employee, whose eye was operated upon by the use of a mucous graft, on July 5th, 1918, for posterior symblepharon which extended from the inner canthus to within 7 millimeters of the external canthus. The symblepharon resulted from a caustic soda burn. Local anaesthesia was used. The photograph was taken Oct. 12th, 1919.

tached laterally to contiguous borders of the scleral conjunctiva, by interrupted sutures of fine silk. The mucous graft which is to be used in repair of the culdesac should be attached to the free border of this conjunctival apron at a later stage. The next procedure is to control all hemorrhage by hot saline compresses. After this is accomplished the mucous graft is selected from the inner surface of the lips or cheeks, as mucous grafts are physiologically ideal for the replacement of conjunctiva, and are better tolerated by the eye than dermic grafts. For a time I used skin grafts for these cases, but discarded them in favor of mucous grafts; for even though the skin graft is modified in the course of time, it never entirely assumes the characteristics of mucous membrane. And it never ceases to be a source of irritation from its dryness, and harshness, and constant exfoliation of epithelium, and sometimes the production of hair. The lower lip is usually chosen, and after the inner surface is sponged with saline solution, the flap is outlined with a scalpel and must be at least twice as large as the surface to be covered. The edge of the flap, including mucous and submucous tissue, is now raised with tooth forceps, dissected with a pair of slightly curved Stevens tenotomy scissors and placed in warm saline solution. Stitching the lip with interrupted sutures is done at this stage, to control the hemorrhage which is profuse. And even though it may be impossible to coapt the edges of the wound, owing to its size, bleeding is controlled, and the mucous membrane is regenerated in a short time. The graft is now removed from the saline solution, slightly dried with sterile gauze, folded over the gloved finger, and all fat trimmed off. The removal of the fat makes the graft very pliable, so that it can be easily stretched and fitted into irregular defects. Grafts should be handled as gently, and as little as possible, so as not to lower their vitality.

The next step in the operation is to transfer the graft to the denuded surface of eyeball and lid, and anchor its borders to scleral and tarsal conjunctiva at several points, with fine iron-dyed silk sutures. Care must be taken to tuck the graft to the bottom of the culdesac. Interrupted sutures of fine silk are now used to complete the mucous patch, stitching its borders to that of the conjunctiva left from the symblepharon if there is any; also to the scleral conjunctiva, the borders of which should be undermined; and lastly to the tarsal conjunctiva and tissue beneath it. Double armed fine silkworm gut sutures are used to attach the graft to the fornix. The needles are inserted through graft and lid as close to the orbital margin as possible, and pierc-

ing the lid, the sutures are threaded through small pearl or glass buttons and tied. If the symblepharon is extensive it may be necessary to use more than one graft.

A canthotomy, if done, should be repaired at the completion of the grafting. The dressing consists of a thin layer of cotton dripping wet with boric acid solution which is laid upon the closed lids, and over this an oval pad of gauze is applied with moderate pressure, and kept in place by crossed strips of adhesive plaster. The dressing should remain on for forty-eight hours, when it is removed and the eye irrigated gently each day with normal saline or boracic acid solution. The deep sutures are left in ten or twelve days, those in the conjunctiva may remain for a week or longer. In most cases it is advisable to perform the operation under a general anesthetic. Four of my cases were done under local anesthesia; using a one-half per cent novocain solution in three, and the same strength solution of apothesin in one, for infiltration of the lid. While the mucous membrane of the lip was anesthetized with an eight per cent cocain solution, by applying it locally. Out of a series of twenty-one cases, I had three failures, which were considerably improved by a second operation.

DISCUSSION

Dr. John M. Banister, Omaha: I have been very much interested in this paper, because there is nothing more discouraging than one of these serious cases of symblepharon. I will briefly refer to a case of my own.

In 1897 I did the grattage operation on a man who was suffering with chronic trachoma of long standing, with pannus. I operated for a general practitioner, and left the man in his charge with instructions to be followed. He neglected to carry out these instructions with the result that a severe symblephason involving the upper half of the globe followed. The eye was immovable. Just at this time I read in the Annals of Ophthalmology an article written by an English ophthalmologist at Cairo, Egypt, describing a method, which he had successfully used in a similar case. Following this method I dissected up the upper lid from the cornea and conjunctiva of the upper half of the globe, having at the same time performed an external canthotomy. I then passed two sutures of silk worm gut through the liberated upper lid near the lower border, everted the lid, and passed the sutures mentioned through a fold of skin on the forehead. When tied these sutures fastened the everted lid to the skin of the forehead. Then the eyeball was covered with a thick coating of sterile vaseline, over which a pad of gauze was placed.

This dressing was renewed frequently, day and night, for several days, and when the sutures were removed, and the lid replaced, no adhesion occurred and the symblephason was cured. The cornea was prevented from drying by the protective vaseline dressing.

Dr. Lee Masten Francis, Buffalo: The late Dr. Beard of Chicago was fond of mucous grafts. He got them in a unique way by turning out the cheek with the thumb and trimming them from the buccal surface. It was less trouble than that described.

Dr. Meyer Wiener, St. Louis: This technic of Dr. Jobson is quite similar to one advised by me ten or twelve years ago. He has merely reversed the use of the flap. Eleven or twelve years ago I utilized the scar of the symblepharon for making a lining for the lower lid, and then filled up the rest of the ocular surface with an epidermal graft, holding it in with a plate which I make of cardboard. It is easily obtained and nonirritative when covered with paraffin. It can be horse-shoe shaped, so as to be held in place and still not interfere with the cornea at all. Since having experience with it in the Army, I think we have a better means of relief by the Esser tunnel, or buried skin graft. We make an incision under the skin and take our piece of stent, cover with the graft, and then sew it under the conjunctiva and you have as deep a sulcus as you wish, depending on the size of the stent.

Dr. E. E. Blaauw, Buffalo, N. Y.: It occurs to me that I might make a suggestion. I do not know how foolish it is, but Dr. Howe is also in the investigation stage. In the war we have learned that we can sever organs; we also take nerves and arteries and put them in fluid and leave them for weeks and they serve a good purpose. I wish some of the younger generation may try to take a mucous membrane from the mouth and cheek and see if you can preserve them so they will be useful.

Dr. N. W. Price, Niagara Falls, N. Y.: I wish to present what we use in Niagara Falls to prevent symblepharon. I have hard rubber artificial eyes of different sizes made by a mechanical dentist but leaving the cornea out, the impressions made from the regular artificial shell eye. When these injuries come in I insert one the correct size and the patient wears it until well. Bichlorid ointment is used to prevent infection.

Dr. A. G. Bennett, Buffalo: With reference to the procedure suggested by Dr. Banister, I recall that when I was a student in 1890 my instructor everted the lid under the forehead and let it down in ten days or two weeks after. That was a burn with caustic potash and the whole conjunctiva in the front part of the eyeball, ocular and orbital was involved.

Dr. E. B. Heckel, Pittsburgh: It is better to prevent them after all. For some time I have been using a method in hot metals. It depends on the type of the burn, but they usually will result in a symblepharon. The patient is put to bed and one to two drops of 1 per cent solution of sterile olive oil two or three times a day and hot pads are used and we get good results. The operation depends on the kind of destruction. The method I have used is this: If the lower lid is adherent, it is dissected down away over the eye-ball and a portion of the dissected area of the lid is left to itself as is the denuded portion of the eyeball. The conjunctiva we cut up close to the cornea on the other side, and the sutures are pulled here (illustrates at board) and the conjunctiva slips over the plug. The lower suture is left and the two ends protrude through the needle and tie on the outside, and that brings it down in the cul de sac. A portion of the lid is left to itself and Nature takes care of that. Shakespeare has said, "Rough hew our ends as we may, Divinity shapes them."

Dr. Jobson (closing discussion): I thank the gentlemen who have discussed my paper, and I would caution the ophthalmologist about being too conservative in his plastic work, if he wishes to be successful. This I learned some time ago, while working under Dr. John B. Roberts, the plastic surgeon of Philadelphia.

OCULAR CHANGES SECONDARY TO INTRACRANIAL INJURIES*

JAS. M. PATTON, M. D., F. A. C. S.
OMAHA, NEB.

It is a well known fact in ophthalmology that there are certain intraocular changes more or less intimately associated with injuries of the brain and skull, which may vary from a slight blurring of the optic disc with engorgement of the retinal vessels to a marked swelling of several diopters. Opinions differ as to the diagnostic and prognostic value of these fundus changes, depending, I am inclined to think, more upon the location of the lesion and stage of the process than upon the personal equation of the examiner.

I was greatly interested some years ago in reading of Sharp's (Archives of Ophthalmology, Vol. 46, Page 320) experimental work on producing artificial papilledema in young puppies. As you recall, he inserted a small gelatine capsule filled with cotton into the aqueduct of Sylvius in order that the cerebro-spinal fluid could not escape from the third and lateral ventricles. In this way he produced an artificial internal hydrocephalus, dilatation of the ventricles and increased intracranial pressure. He was able to observe disc changes within five or six hours, consecutive blurring of the nasal portion of the optic discs, congestion of the retinal veins and a gradual increase of the symptoms. In from twelve to twenty-eight hours the details of the disc were obliterated in four of the puppies with a measurable elevation at the end of that time. In the other cases, measurable swelling appeared from twelve to twenty hours later. Later decompression and draining relieved the symptoms in the reverse order of their appearance so that the discs returned to their normal condition except in cases where the decompressive measures were insufficient.

Shortly after reading Sharp's report, I had the opportunity to study three cases of skull fracture in which I was able to make ophthalmoscopic examinations at three hour intervals, beginning from six to twelve hours after the injury. In one case, there was the progressive blurring, congestion, etc., described by Sharp, which continued until the death of the patient thirty-six hours

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after the injury. Two other cases of undoubted skull fracture failed to develop any intraocular changes whatever and made uneventful recoveries. It occurred to me at the time that there might be some prognostic value in the early appearance of disc changes, and with this thought in mind, I was especially interested in observing fundus changes in connection with my service with the A. E. F.

Greenwood (Medical War Manual No. 3, Page 41) was insistent on the importance of intraocular examination in all cases of skull or brain injuries, superficial cases as well as those in which the bone and deep structures were involved, on the theory that all injuries of this nature may and frequently do give rise to increased intracranial pressure, "The first signs of which is rapidly developing optic neuritis which quickly increases to choking of the disc. In these cases the optic neuritis from the start is of the choked disc or intracranial type." He further differentiates this type from the neuro-retinitis of meningitis. He supplemented this by incorporating in circular No. 1, Headquarters Medical Consultants, A. E. F., A. P. O. 731, Division of Ophthalmology, September, 1918, under brain injuries, "All brain injuries or severe cranial wounds likely to show brain involvement should be frequently examined by the ophthalmic surgeon, and all opportunities should be improved for studying the fundi and fields of vision in such cases."

It was my good fortune to be stationed in the hospital center at Vittel, A. P. O. 732, with the status of consultant in ophthalmology, from early in September, 1918, until after the signing of the armistice, and was thus enabled to study cases through both the St. Mihiel and Argonne offensives. During part of this time the Center functionated in a semievacuation capacity and we were unable, in some cases, to make repeated examinations before the patient was evacuated to the bases farther back. I wish to express my appreciation of the cordial cooperation on the part of the members of the surgical, neurologic and ear, nose and throat staffs. Cases were studied purely from a standpoint of diagnosis, the treatment in each case being supervised by the surgical staff or by Major Haughey, chief of the department of ear, nose and throat.

From the reports of the department, I find that during the above period we made intraocular studies of fifty-nine cases, varying from comparatively slight contusions and scalp wounds to those in which there was extensive loss of skull and brain substance. Of these fifty-nine cases examined, twenty showed

definite changes in the disc while seven with definite skull fractures showed no intraocular changes. Unfortunately, these figures are of no value from a comparative standpoint as part of my case records were lost, and while it is presumable that the other thirty-two cases did not show intraocular changes, I cannot be positive as to this. As practically all cases of scalp wounds were examined, it is entirely possible that the thirty-two cases were free from intraocular involvement.

In three of the cases, magnetic foreign bodies were removed, in two of them from the brain substance, and in at least four there was positive evidence of brain abscess, two developed a basilar meningitis in neither of which were the intraocular changes at all marked, due, no doubt, to the large traumatic decompression present in both cases. Three were recent fractures occurring in the hospital area, none of which developed intraocular changes.

A brief review of a case from each of these groups will illustrate their respective findings.

H. E., mechanic, sustained a gunshot wound two inches back of the left ear. Examinations 10-2-18, presumably forty-eight hours after the injury, showed a very slightly blurring of both discs, retinal veins not engorged, pupil reflexes normal but complains of slight haziness of vision. Examination the following day showed slight increase of symptoms, discs now distinctly blurred, vessels slightly engorged, pulse 55, no other evidence of intracranial pressure. On the 4th, discs showed an elevation of one diopter with a pulse of 60. On the 8th there was a decided improvement in the intraocular condition and his general condition was better, while on the 14th, twelve days after the first examination, discs were normal and the general condition of the patient was entirely satisfactory. The case just quoted represents a severe type. The following is one of the average type:

J. B., private, gunshot wound of the head, October 8th, without fracture. Examination October 11th, three days after injury, showed a very slight blurring of the right disc, the left disc being normal. Subsequent examination showed slight change, general condition favorable, evacuated.

Of the cases with intracranial foreign bodies, the following is of interest:

W. M., private, examined 9-19-18, was taken directly from the ambulance to the operating pavilion approximately twenty-four hours after injury. An irregular foreign body two or three centimeters below the vertex in the right brain was shown by

the X-ray. Ophthalmoscopic examination on the operating table showed the pupils small, marked blurring of the right disc, vessels engorged, slight elevation, left disc blurry but not elevated. Under local anesthesia, the scalp wound was cleaned, skull wound enlarged and a fragment of shrapnel removed from the brain substance by means of a Lancaster portable magnet, the tip being supplemented by a short steel rod which was first passed down to the region of the foreign body and held against the tip of the magnet while the current was turned on. Major Barrett operating. On the following day there was a perceptible improvement in the condition of both discs, these being practically normal at the end of ten days.

The following case, P. B., private, presented a scalp wound near the vertex which he had received approximately two days before our examination, 9-20-18, but the X-ray did not show a foreign body nor any perceptible splintering of the inner table. The patient's vision was apparently normal while his mentality was decidedly blurred. There was a decided blurring of both discs with an elevation of one diopter or less. He was examined daily for five days and as there was a gradual increase in the amount of the disc elevation, the surgeon in charge decided to do a decompression. Under local anesthesia, the scalp wound was reopened and a slightly depressed fracture of the skull exposed. The depressed skull fragments were elevated and a few fine superficial bone splinters removed from the dura. There was no shock following the operation, the intraocular symptoms subsided promptly, the mental blurring disappeared and the patient made an uneventful recovery.

A case of traumatic brain abscess in which there was a large traumatic decompression but with no evidence of intracranial pressure corroborates the experiences of Sharp with reference to obstructing internal hydrocephalus. On Oct. 3, 1918, I was requested by the department of surgery to examine the fundus of Corporal S., who had been under treatment for several days for a badly infected vertex wound. There was a large destruction of the bony tissue with exposure of the brain substance. Patient complained of some headache and was rather drowsy. The right lids were puffy, pupils both reacted normally, the disc edges blurry, vessels engorged with slight elevation. In spite of the large skull defect and apparent free drainage, there was a gradual increase of the papillary edema until just before death, October 23rd, it reached a height of six diopters in the right eye and five in the left with rather numerous subhyaloid hemor-

rhages appearing three or four days earlier. The patient complained of intense headache but as there were no other symptoms of brain abscess and the adjacent portions of the brain were draining so freely, the surgical department hesitated to explore the deeper structures despite the ocular picture. About fifteen hours before death, there was a hernia of brain substance, followed by relief of the pain. Post mortem showed a large abscess in, or in the region of the right lateral ventricle which evidently by its rapid progress and local pressure produced the marked ocular symptoms.

Of the three cases of skull fracture occurring in the hospital area, two of them were basilar of the usual type. Neither showed any ocular changes or any other evidence of intracranial pressure. Both recovered promptly. In the third, Private G, the fracture was in the right fronto-temporal region and associated with fractures of the jaw and pelvis. When examined twelve hours after the injury, pupils were small, patient restless and unconscious, the right fundus was perfectly normal with no evidences of intracranial pressure, the left normal or with a possibly very slight engorgement of the retinal veins at the nasal side of the disc. On account of the general condition, a subtemporal decompression was performed by the surgeon in charge with clearing of the fracture area. Patient died twenty-four hours after the injury, apparently as the result of concussion. Autopsy showed a very extensive disorganization of brain substance with a large blood clot over the frontal lobe. This was the only case that I saw in which an extensive skull or brain lesion went on to a fatal termination without showing some ocular disturbances and in this case the shock was so severe that the patient apparently died from this cause.

Case reports could be multiplied but these are sufficient to present the several types. There were individual variations, of course, but fortunately the department was able, through observation of the fundus findings, to throw considerable light on the activity and progress of the intracranial lesions. In but one instance were the fundus findings misleading, the case of the man who died in shock, and in view of the early decompression, we could scarcely expect much change in the intraocular picture. In the others the ophthalmoscopic findings were verified by the progress of the cases.

Jessop (Ophthalmoscope, London, Vol. 13, Page 592) was surprised at the large proportion of cases of papilledema seen in connection with injuries of the skull. Usually these edemas were slight, not more than one diopter, in rare cases going to

three or four. This corresponds to the cases that came under my observation, the degree of papilledema corresponding somewhat to the severity of the traumatism. Aside from the papilledema, he found few other intraocular signs and as a rule, visual disturbances were not at all marked. In his cases there was a consequent disappearance of the intraocular pathology on relief of the brain pressure, and while there were some cases in which there was a slight paling of the disc, there was no functional evidence of optic nerve atrophy. He attributes disc changes to either brain edema or an increasing amount of cerebro-spinal fluid with hemorrhages into the subarachnoid space. From his cases he was not convinced that injuries without fracture produced a true papilledema, but he quotes Lister to the effect that papilledema may follow concussion of the brain without fracture, the disc changes being due to a true swelling of the brain or extensive hemorrhages. He was unable to trace any connection between the location of the injury and the optic disc most markedly affected. As to after-treatment, he considers an actively progressive papilledema as a positive indication for operative interference. On the other hand, if the blurring is slight, even though persistent, a spinal puncture may be all that is necessary.

Spiro (Ophthalmoscope, London, Vol. 23, Page 616 Abst.) considers choked disc to be an absolute indication for decompressive measures.

Wm. Sharp (Laryngoscope, Vol. 24, Page 200) reports two cases of intracranial pressure associated with brain abscess in which there were apparent intervals of relief followed by attacks of severe headache and stupor. In each instance the increased pressure was very evident in the blurring of the nasal halves of both discs, intraocular symptoms fading promptly with relief of the pressure symptoms.

From the above it is evident that:

I. The presence of papilledema, especially when associated with recent intracranial injuries, is positive evidence of increased intracranial pressure.

II. In cases where an extensive traumatic decompression is present, should the disc become progressively blurred, further relief of pressure should be secured.

III. In milder cases, the symptoms above referred to may be relieved by means of a spinal puncture.

IV. Even though there may be an extensive fracture, providing there is no great destruction of brain tissue, the absence of progressive papilledema is of very favorable prognostic significance.

DISCUSSION

Dr. Wilfrid Haughey, Battle Creek, Mich.: Until Dr. Patton came to Base Hospital 36 I had charge of the eye work along with the ear, nose and throat, and my experience during the Chateau Thierry drive was the same as his in the St. Mihiel and Argonne offensives.

Two or three cases from the ear department will illustrate some of the points the Doctor has made.

Private ——, Company I, 108th Infantry, was injured the first day of the St. Mihiel drive. A fragment of shell punctured the skull two inches above the left ear and lodged, as the x-ray showed, to the left of the median line, on a level with and 1 cm. back of the sella. He had complete aphasia, practically unconscious, semiparesis, deep reflexes diminished, the right leg, arm and hand showing partial paralysis. On September 19th he continued about the same, pulse about 60. On September 20th I removed the foreign body, and the next day he improved considerably. His reflexes returned, only to last a few days, and then gradually disappeared.

Dr. Patton examined the fundus of this man. The pupillary reflexes were slow until the 24th, with slight blurring of the right disc.

On the 26th the left disc was also involved, increasing until the 28th, when the man died. The postmortem showed a few fragments of bone in the tract of the foreign body, with an abscess at the end of the tract.

The foreign body removed under the fluoroscope was not magnetic. I found hairs which had been carried into the wound. The skull plate showed just a slit where the foreign body went in sidewise. For the first few days the symptoms were of shock which probably account for the fact that he had no fundus changes at first. The abscess was of slow infection and developed only after some days.

Another patient with a battle injury the same day, a private from 167th Inf., that is, from Alabama. Injured on top of head, compound fracture on right side. There was decompression, about 3 inches of bone nearly an inch wide removed; but there was a fracture extending down almost to the base on the other side. He was immediately unconscious for 20 minutes. Then consciousness returned, but with complete paralysis of both legs. The operation, a complete closure, which was the orders in the A. E. F., was done at once. When he came to our hospital the next day we had to open it on account of pus. In a number of days he developed hernia of the brain with blurring of the discs, and went on to death.

Another case was a private in 361st Inf. He was of Jewish descent. While making a charge up hill an American shell struck a tree, tore off a piece of wood which struck him over the head and took out a triangular piece of bone across the forehead. He came in October 2nd. Both eyes showed slight engorgement of the vessels but no blurring of the discs. On the 8th the same. On the 14th general cerebritis developed with a temperature of 104, and he died on the 18th. His mentality remained perfect (with the exception that he could not concentrate a great length of time), until a few hours before death, but he had an extensive involvement of the brain for three days, and during that time the blurring of the disc was very great.

Our experience was as Dr. Patton said, as the pressure increased the blurring of the disc increased, and right along throughout our cases, as the symptoms and condition of the men improved, the blurring of the disc improved.

Dr. S. Hanford McKee, Montreal: My part of the discussion is the showing of some slides. In seeing these cases of injury I was surprised that so many men complained of dimness of vision, due to diffuse cloud-

ness of the retina, numerous small exudates in the choroid, and fine dust like opacities in the victims, that is, a condition due to trauma identical with retino-choroiditis syphilitica.

The slides shown were photographed from original drawings made by one of my sergeants over seas.

Dr. E. E. Blaauw, Buffalo: I just want to ask Dr. Patton, who has had such a remarkable opportunity, when we speak about pathologic engorgement of the vessels, when is it pathologic? And what and where are the primary symptoms of a neuritis and beginning papilledema? Do you as an expert agree with W. Sharpe that it is at the nasal side of the disc? I have concluded that in about 10 per cent of the discs, the nasal side is rather blurred as compared with the temporal side. It seems to me that the primary finding has only value when the upper and lower side of the disc show the slight blurring. I want to ask, if in these cases you saw, did you make a section of the optic nerve?

Dr. Chapman, of Milwaukee: I would like to ask the essayist regarding that part of his paper in which he states there was "engorgement of the retinal vessels." The experience, from my observation, has been that the engorgement is of the retinal *veins*, due to obstruction to the return flow. I would like to ask whether or not he was able to determine this engorgement of veins with reference to comparative size of retinal veins and arteries before the papilledema occurred and, if so, how long before it occurred as manifested by the blurring of nasal side of the disc.

Dr. Patton (closing discussion): I wish to congratulate Dr. McKee on the beautiful series of plates.

When you first see the cases, you cannot say positively whether the engorgement is pathologic or not. You have the comparison with the well eye, and if in your subsequent examination you find an increase in these symptoms you may be justified in very strongly suspecting an increase in the intracranial pressure. Dr. Blaauw very properly says the nasal side of the disc is indistinct normally as compared to the temporal, but if this blurring progressively increases for six or ten hours, it establishes the diagnosis.

As to the other question with regard to pathologic examination, I am sorry to say that owing to the extreme pressure of work, we were unable to go into this phase of the examination. In some cases it was even difficult to secure a postmortem examination. The cooperation we had from the other doctors in the hospital helped us greatly, and my excuse for presenting this subject is that in cases of skull fracture the prognosis is not only a serious matter for the patient, but also for the family and friends, and if we can give them some measure of comfort, we will do them a service and protect ourselves.

Another thing I want to speak of, something that we have thought of frequently, and especially yesterday when, as Dr. Greenwood was reading his paper, he spoke so kindly of his officers and told something of the work they did, I am sure I speak for every ophthalmologist in the A. E. F. when I express to him our sincere gratitude for the splendid care he took of us. We feel that he was not only interested in the welfare of his department, but he took care of us personally, and we knew we had a real friend in the Senior Consultant's Office.

AN ANALYTIC STUDY OF THE EFFECT ON ACCOMMODATION PRODUCED BY THE CYCLOPLEGICS IN GENERAL USE

JOHN R. NEWCOMB, M. D., AND B. J. LARKIN, M. D.
INDIANAPOLIS, IND.

A comprehensive review of the literature on the subject of the cycloplegics is not feasible in this report and but a few selections have been made of those reports which are most representative of the previous literature.

Among the earlier American essays upon the subject of the cycloplegics that of Dr. S. D. Risley, appearing in the Transactions of the American Ophthalmologic Society for 1881, stands out preeminently, and a brief review of his conclusions is of great interest and value at this time. Doctor Risley's article on "The Comparative Value of the Mydriatics" has to do particularly with the comparative action of the solution of sulphat of hyoscyamin, of atropin sulphat and of homatropin solution. In regard to atropin Dr. Risley states: "The long experience which has been had in the use of the sulphate of atropin, and the numerous observations which have been made as to its physiological action, have placed its merits upon quite a certain footing and made its properties the natural standard of comparison." All investigators agree with this statement and today atropin continues to hold its position as the natural standard of comparison. The use of the sulphat of hyoscyamin was thoroughly investigated by Dr. Risley, and after observing its action in ninety cases he arrived at the following conclusions:

"First: That the sulphate of hyoscyamin in a solution of grains 2 to the fluid ounce is competent to quickly paralyze the accommodation.

"Second: That it does not cause more conjunctival irritation than solution of the sulphate of atropin.

"Third: That the duration of its influence over the accommodation is less than half that of atropin.

"Fourth: That it causes less constitutional disturbance than a corresponding solution of the sulphate of duboisin."

The comparisons drawn by Doctor Risley in the use of atropin, hyoscyamin and homatropin are expressed as follows:

"Homatropin was used in comparison with atropin in 70 eyes, appearing superior in 14, equal in 23 and inferior in 22.

"Homatropin was used in comparison with hyoscyamin in 4 eyes, appearing superior in none, equal in 3 and inferior in 1.

"Hyoscyamin was used in comparison with atropin in 29 eyes, appearing superior in 4, equal in 13 and inferior in 10."

Dr. Risley's investigations were most thorough and painstaking, and the only possible exception which may be taken to his findings must be based upon the possible impurity and instability of the homatropin and hyoscyamin which were then obtainable. Granting that the alkaloids then on the market were inferior to those of today, which may account for some of the unusual individual findings recorded in the article, it must be admitted that this paper, published in 1881, differs but slightly, if at all, from the observations of later observers. Dr. Risley's conclusions in regard to atropin and hyoscyamin were unquestionably accepted as standards when his paper was published, and we will do well to accept them as standards today. His observations on the action of homatropin will bear revision in some respects, but it must be remembered that the drug of 1881 and the drug of today are quite different in stability and in alkaloidal content.

Dr. Lucien Howe, in his work "The Muscles of the Eye," states that atropin sulphat, even in minimum quantity, is apparently much more constant in its action on normal eyes than homatropin hydrobromat, but he makes no comparison with scopolamin or hyoscyamin. He states that in order to determine the refraction as accurately as is possible at a single visit, it is best to use atropin in the form of ophthalmic discs. The dose recommended is 1/500 to 1/250 of a grain. In regard to homatropin he observes that, "When we are satisfied to know, perhaps approximately, the condition of the refraction without regard to the accommodation, about 1/50 of a grain of homatropin is by far the most convenient." He concurs with Straub that the homatropin is best used in the form of the ophthalmic disc.

The views of Risley and Howe are shared by Snellen and, in most part, by Dr. Casey Wood. Dr. Wood states in his "System of Ophthalmic Therapeutics": "Notwithstanding some drawbacks, atropin and its salts (especially the sulphate) continue to be the most reliable and best known cycloplegic remedies, whether for determining the refractive condition, for giving the eye a 'ciliary rest-cure,' or for the treatment of active disease." In regard to scopolamin, he states that the drug is quite five times

as powerful as atropin sulphat and warns against its extreme toxicity.

Reference to many other authors establishes the fact that atropin constitutes the standard cycloplegic. Scopolamin is regarded rather favorably, with a possible exaggeration of the possibility of toxic effects. Homatropin is thoroughly advocated by some and utterly condemned by others. No one cycloplegic agent can be used in every eye, without exception, and the fact becomes more and more apparent that insufficient knowledge of the potency, the toxicity and the limitations of the various cycloplegics has been responsible for much of the disagreement and discussion as to their respective merits. The question of the value of atropin and scopolamin as cycloplegic agents has been settled in the affirmative, but there remain widely divergent opinions in regard to the average adequate cycloplegic dose of these drugs. The writings of Risley, Weeks, de Schweinitz, Wood, Snellen, Thorington and others disagree almost universally in regard to dosage, strength of solution, frequency of instillation, time of establishment of actual cycloplegia, and the duration of the cycloplegia. Detailed reference to the variance of opinions will not be made, but the inference may well be drawn that patients are either being overdosed by those who give the maximum, or that complete ciliary relaxation is not being obtained by those advocating the lesser dosage. It is of unquestionable importance to obtain complete functional relaxation of the ciliary muscle if we attempt induction of cycloplegia at all, and it is imperative that we avoid an excess of medication. The determination of the establishment of absolute functional ciliary relaxation may possibly be worked out in the laboratory, but for practical purposes this cannot be attempted in the clinic or in the office. The practical estimation of loss of ciliary muscle function must needs be relative, but certain standards may be set up which will reduce the probability of error to a minimum and such an estimation is as important in refraction work as is the determination of extraocular muscle balance. The attention of ophthalmologists has been directed to this before, but the application of the test has not been generally adopted. The universal adoption of the practice of measuring loss of ciliary muscle function following the instillation of a cycloplegic would eliminate the greatest source of error in present-day refraction work. No two cases react in identical manner following the instillation of a cycloplegic; no two cases have the same amount of ciliary muscle tone, or hypertrophy, or cramp to be overcome, and until the accommodation of

each case is carefully studied and the loss of accommodative power following the use of a cycloplegic is measured as accurately as possible, there will be no standardization of methods and no agreement as to the proper manner of securing cycloplegia. The method followed in the investigations outlined in this report is easy of application, reasonably accurate and will establish, approximately at least, the loss of ciliary muscle activity following the cycloplegic. It is a method which has been known for years and offers a practical method readily adapted to use in the clinic or office. The method will be described later.

In this preliminary paper it was deemed best to limit the report to the observations on the comparative activity of homatropin and erythroxylin in solution and in the form of the ophthalmic disc, and on the comparative action of homatropin in solution and of scopolamin in children. The observations on the action of atropin and scopolamin made thus far have apparently established the fact that either drug in proper strength will produce a state of cycloplegia which represents a complete cessation of ciliary function, in so far as we are able to judge. In the majority of cases (not, however, including those cases in which there exists accommodative spasm or marked ciliary hypertrophy) atropin in one per cent solution, or scopolamin in one-fifth of one per cent solution instilled at fifteen-minute intervals, a total of three instillations, will produce this satisfactory cycloplegia in approximately ninety minutes. The action of the atropin and of the scopolamin was identical so far as the end result was concerned, but it was observed that the scopolamin affected the accommodation with somewhat greater rapidity than did the atropin sulphat solution. It would seem from the results observed that the general custom is to use an excessive amount of these drugs. The observations as to time and dosage will not pass without challenge, but although the experiments carried out were limited, the findings in the few cases examined were sufficiently definite to corroborate the evidence submitted by previous observers. In the final report on this subject, further and more conclusive tests will be presented for your consideration.

In the comparative study of the action of homatropin in solution and in the form of the ophthalmic discs the combination of homatropin with an equal amount of erythroxylin was employed. It has been reasonably proven that the addition of erythroxylin greatly enhances the value of the alkaloidal action of the homatropin. Dr. Casey Wood, in his "System of Ophthalmic Therapeutics," states, "The addition of cocain to almost all

the alkaloids used in ophthalmic practice undoubtedly increases their peculiar effects." The solution used was freshly prepared and contained two percent of homatropin hydrobromat and erythroxylin hydrochlorid. The discs contained one-fiftieth of a grain of homatropin hydrobromat and an equal amount of erythroxylin hydrochlorid. The discs were not made up with a gelatine base but with gluten, the gelatine disc possessing marked disadvantages.

The experiments were carried out with as great regard for accuracy as was possible and the selection of the patients was made with due discrimination as to intelligence and age. The ages of the patients ranged between seventeen and thirty-eight, and only private patients were examined in order to insure the reliability of the measurements made. The determination of the loss in accommodation following the instillation of the drugs was based upon the actual dioptric loss in the following manner:

The test object used for the establishment of the punctum proximum was a small checkerboard of black and white squares of such size as to place the punctum proximum of the emmetropic eye at 33.3 centimeters. If the eye under observation was ametropic a lens of sufficient strength was placed before the eye to establish the punctum proximum at this fixed distance and record of the lens employed was made. The cyclopegic was then instilled. With the solution instillations were made every ten minutes for fifty minutes, a total of six drops being instilled in each eye. With the ophthalmic disc but one instillation was made. Every ten minutes after the initiation of cycloplegia and extending for a period of ninety minutes the measurement was made to determine the loss in accommodation. The test object was maintained at the fixed distance prescribed and lenses, gradually increasing in strength, were placed before the patient's eye until the test object was clearly observed by the patient. In this manner the actual loss in accommodation, expressed in diopters, was approximately determined. At the expiration of thirty, sixty and ninety minutes accurate objective examination with the skiascope was made and the skiascopic findings recorded. The record sheet, Chart No. 1, illustrates the manner of procedure and the methods followed in recording the findings in each case. Twenty-five patients were examined under the solution of homatropin and erythroxylin, and a like number in whose eyes the ophthalmic disc had been placed. An analysis of the records of these fifty patients is presented in Chart No. 2.

CHART No. 1

SPECIMEN RECORD SHEETS

Series A. Patient No. 4. Name: Moulton, Wm. age 24. Date: 7-9-1919.
Observations recorded by Dr. Newcomb, Dr. Larkin.
Reading of test previous to instillation.....0.00 D. required
Instillation of drops at 7.45, 7.55, 8.05, 8.15, 8.25, 8.35.
Reading of test 10 minutes after 1st drop.....0.50 D. "
Reading of test 10 minutes after 2nd drop.....1.00 D. "
Reading of test 10 minutes after 3rd drop.....1.50 D. "
Reading of test 10 minutes after 4th drop.....2.00 D. "
Reading of test 10 minutes after 5th drop.....2.25 D. "
Reading of test 10 minutes after 6th drop.....2.50 D. "
Reading of test 90 minutes after 1st drop.....2.50 D. "

Maximum loss in accommodation *2.50 D.* observed in *60* minutes.

Skiascopic examination 30 mins. after 1st drop	O.D.	+1.25 / +1.75	O. S. +1.25 / +1.50
Skiascopic examination 60 mins. after 1st drop	O.D.	+1.50 / +2.00	O. S. +1.25 / +1.50
Skiascopic examination 90 mins. after 1st drop	O.D.	+1.50 / +2.25	O. S. +1.25 / +1.75

Series B. Patient No. 1. Name: Mary Pratt. Age 36. Date: 7-1-1919.
Observations recorded by Dr. Newcomb, Dr. Larkin.
Disc instilled at 8.00 p.m.

Correct reading of test object previous to instillation.....0.00 D. required
Correct reading of test object 10 mins. after instillation..0.50 D. "
Correct reading of test object 20 mins. after instillation..1.00 D. "
Correct reading of test object 30 mins. after instillation..1.75 D. "
Correct reading of test object 40 mins. after instillation..2.50 D. "
Correct reading of test object 50 mins. after instillation..3.00 D. "
Correct reading of test object 60 mins. after instillation..3.00 D. "
Correct reading of test object 90 mins. after instillation..3.00 D. "

Maximum loss in accommodation, *3.00 D.*, observed in *50* minutes.

Skiascopic examin'n at expiration of 30 mins.,	O.D.	+1.00 / +1.50	O. S. +1.00 / +1.25
Skiascopic examin'n at expiration of 60 mins.,	O.D.	+1.50 / +2.00	O. S. +1.50 / +2.00
Skiascopic examin'n at expiration of 90 mins.,	O.D.	+1.50 / +2.00	O. S. +1.50 / +2.00

CHART No. 2

Loss in accommodation, expressed in diopters, following instillation of

Solution of Homatropin and Erythroxylin, aa 2%	D	D	Ophthalmic Disc of Homatropin and Erythroxylin, aa gr. 1/50
10 minutes after 1st drop	0.356	0.69	10 minutes after instillation
20 minutes after 1st drop	0.555	1.56	20 minutes after instillation
30 minutes after 1st drop	1.109	2.13	30 minutes after instillation
40 minutes after 1st drop	1.705	2.36	40 minutes after instillation
50 minutes after 1st drop	1.938	2.80	50 minutes after instillation
60 minutes after 1st drop	**2.264**	**2.99**	**60 minutes after installation**
90 minutes after 1st drop	2.333	2.94	90 minutes after instillation

In Chart No. 3 the summarized findings are shown.

CHART No. 3

	Average maximum loss	Recorded in minutes
Solution	2.429 D	70.6
Disc	3.05 D	53.5

The apparent discrepancy in the figures in Chart No. 3, giving the average maximum loss, and the figures in Chart No. 2, giving the loss in diopters of accommodation is due to the fact that the maximum loss in accommodation occurred at times varying from forty to ninety minutes and the figures in Chart No. 2 do not show maximum loss because of this variation in the element of time.

A consideration of these two charts brings forth some very interesting points for discussion and consideration. Remembering that one drop of a two per cent solution contains approximately 1/50 of a grain of the drug, it is interesting to note the difference in the dioptric loss in accommodation following the instillation of 1/50 grain in the form of a solution and the loss recorded following the use of the same amount of drug in disc form. Even after the instillation of a second 1/50 grain in the form of a solution the loss in accommodation observed is not equal to that present after but one-fiftieth in the disc form. It will be observed that even after the sixth drop of solution had been instilled, fifty minutes after the first instillation of 1/50 grain in solution, the loss in accommodation is almost one diopter less than the loss found fifty minutes after the instillation of the disc of 1/50 grain. It is not until the full ninety minutes have elapsed that the loss with the solution even approximates that with the disc. By referring to Chart No. 3 it is seen that the average maximum loss observed following the use of the solution is 0.621 diopters less than the average loss produced by the disc. In point of time the maximum effect with the disc was observed at an average of fifty-three and five-tenths minutes as against seventy and six-tenths minutes required for a maximum effect from the solution.

The analysis of these preliminary experiments shows that with the disc of homatropin and erythroxylin containing 1/50 grain of each drug six hundred and twenty-one one-thousandths of a diopter more loss in accommodation was obtained than with the six drops of two per cent solution, and it was obtained in seventeen and one-tenth minutes less time. The only explanation for this is embodied in Dr. Casey Wood's statement that, "In the shape of watery solutions probably less than ten per cent of the dissolved alkaloid becomes absorbed in such a way as to affect the eye, the remaining ninety per cent or more being carried off into the nasal duct or flowing over the cheek with the tears." There being no authority for disputing Dr. Wood's statement let us accept it as approximately correct and draw mathematical deduc-

tions therefrom. If but one-tenth of the solution instilled is actually absorbed by the eye it would mean that out of the six drops instilled, representing approximately one hundred and twenty-one one-thousandths of a grain, but twelve one-thousandths of a grain is actually productive of cycloplegia. Working out the mathematical ratio with this and the loss of accommodation observed in the experiments noted above, the result shows that in order to obtain the loss in accommodation determined following the use of the disc it would be necessary for the eye to absorb fifteen one-thousandths of the twenty-one thousandths actually in the disc. If Dr. Wood's statement is accurate and if the results of the experiments noted above are reasonably accurate, the calculation in terms of per cent shows a loss of alkaloid of but twenty-five per cent when the disc is employed, as against the estimated loss of ninety per cent or more when the solution is used. This may seem a rather fanciful conclusion to draw, but it merits consideration, and the facts thus far brought out transform the possibility into a probability. Let it so stand until it is otherwise proven!

As was stated before, skiascopic examinations were made of each case in the homatropin series at the expiration of thirty, sixty and ninety minutes. A study of these findings seemingly indicates a superiority of homatropin in disc form over the same drug in solution. A brief resumé of the tabulated findings shows that thirty minutes after the first drop of solution was instilled (or immediately following the instillation of the fourth drop) there was 0.384 of one diopter variation from the findings made at the end of ninety minutes, or forty minutes after the sixth drop had been instilled. Following the use of the one ophthalmic disc there was found but 0.298 of one diopter variation in the skiascopic findings made at the expiration of thirty minutes and ninety minutes. This indicates a greater rapidity of action when the drug is employed in the disc form. Again when the solution was used it was found that there was a variation of 0.143 of one diopter between the skiascopic examinations made at the end of sixty and ninety minutes, but when the disc was used this variation amounted to but 0.069.

In the cases examined under the solution of homatropin and erythroxylin, sixteen of the twenty-five did not have a full loss in accommodation. Of these sixteen seven were cases of myopia and nine were hyperopic. With the disc cases nine of the twenty-five examined did not have full loss of accommodation. Six of these were myopic and three hyperopic. The tests as made with

the test object at a fixed distance of 33.3 centimeters required a correcting lens of 3.00 dioptres if full loss of accommodation was attained and it was noted that in the disc cases but one required a lens less than 2.75 dioptres in strength. In the cases with which the solution was used a lens of 1.25 dioptres was required in one case, and in this case there did not exist any spasm of accommo-

CHART NO. 4

Variation in Skiascopic Findings Observed in Refractions at 30 and 90 Minute Intervals and at 60 and 90 Minute Intervals, Expressed in Diopters

	Variation 30 and 90		Variation 60 and 90	
Case No.	Solution	Disc	Solution	Disc
1	0.50	0.50	0.12	0.00
2	0.50	0.25	0.12	0.12
3	0.37	0.37	0.12	0.00
4	0.25	0.25	0.25	0.00
5	0.37	0.37	0.12	0.00
6	0.25	0.25	0.25	0.00
7	0.25	0.75	0.00	0.25
8	0.59	0.00	0.00	0.00
9	0.12	0.37	0.12	0.00
10	0.25	0.00	0.00	0.00
11	0.25	0.12	0.12	0.00
12	0.37	0.00	0.12	0.00
13	0.37	0.50	0.12	0.12
14	1.75	0.25	0.25	0.25
15	0.25	0.25	0.00	0.25
16	0.25	0.25	0.00	0.25
17	0.37	0.50	0.00	0.75
18	0.25	0.00	0.00	0.00
19	0.25	0.25	0.00	0.00
20	0.25	0.50	0.00	0.00
21	0.50	0.12	0.25	0.00
22	0.75	0.25	0.75	0.00
23	0.75	0.75	0.12	0.00
24	0.25	0.25	0.00	0.00
25	0.75	0.37	0.50	0.00
Average variation	0.384	0.298	0.143	0.069

dation nor was the error of refraction of such character as to account for the low loss in accommodation.

The second experiment of this series consisted of the examination of fifty children following the instillation of a solution of homatropin, this followed by a second examination after the instillation of a solution of scopolamin. It was found that no

CHART NO.5
Skiascopic records of examinations under Homatropin and Scopolamin. Variation.

NO.	AGE.	O.D.	O.S.	O.D.	O.S.	O.D.	O.S.
1	12	+1.25 / +1.50	+1.50 / +1.75	+1.50 / +1.75	+1.75 / +2.00	+.25 / +.25	+.25 / +.25
2	13	+1.00 / +1.50	+1.50 / +2.00	+1.25 / +2.25	+1.50 / +2.25	+.25 / +.75	+0.0 / +.25
3	13	+0.50 / +1.00	+0.75 / +1.25	+0.75 / +1.50	+1.00 / +1.50	+0.25 / +0.50	+.25 / +.25
4	14	-4.50 / 0.00	0.00 / -3.75	-4.00 / 0.00	-4.00 / 0.00	+0.50 / 0.00	+.25 / 0.00
5	16	+0.50 / +2.25	+0.50 / +2.25	+0.50 / +2.75	+0.75 / +2.75	+0.00 / +0.50	+.25 / 0.00
6	14	+1.75 / +2.50	+2.50 / +3.00	+1.75 / +2.50	+2.25 / +3.00	+0.00 / +0.00	+.50 / +.50
7	14	+2.50 / +3.00	+3.00 / +3.50	+2.75 / +3.25	+3.00 / +3.25	+0.25 / +0.25	0.00 / +.25
8	13	+2.25 / +2.75	+2.50 / +2.50	+2.50 / +3.00	+2.50 / +2.50	+0.25 / +0.25	0.00 / 0.00
9	13	+1.25 / +1.25	+1.50 / +1.50	+1.50 / +1.50	+1.75 / +1.75	+0.25 / +0.25	+.25 / +.25
10	14	+2.25 / +2.75	+2.00 / +2.50	+3.50 / +4.25	+3.25 / +4.00	+1.25 / +1.50	+1.25 / +1.50
11	14	+1.25 / +1.25	+1.25 / +1.25	+1.50 / +1.50	+1.50 / +1.50	+0.25 / +0.25	+0.25 / +0.25

		-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
12	14	+0.75	+0.75	+0.75	+0.75	-0.00	-0.00
		+1.00	+1.25	+1.50	+2.00	+0.50	+0.75
13	12	+1.00	+1.25	+1.50	+2.00	+0.50	+0.75
		+0.50	+1.00	+1.25	+1.50	+0.75	+0.50
14	14	+1.00	+1.50	+1.50	+2.00	+0.50	+0.50
		+1.75	+1.75	+2.25	+2.25	+0.50	+0.50
15	15	+2.00	+2.00	+2.25	+2.25	+0.25	+0.25
		+0.50	+0.50	+0.75	+0.75	+0.25	+0.25
16	15	+0.50	+0.50	+1.00	+0.75	+0.50	+0.25
		+1.50	+1.50	+1.75	+1.50	+0.25	0.00
17	15	+2.00	+2.00	+2.50	+2.50	+0.50	+0.50
		+0.75	+0.75	+1.00	+1.25	+0.25	+0.50
18	15	+0.75	+0.75	+1.25	+1.50	+0.50	+0.75
		+0.50	+0.50	+0.75	+0.75	+0.25	+0.25
19	15	+1.00	+1.00	+1.00	+1.25	0.00	+0.25
		+0.75	+0.75	+0.75	+0.75	0.00	0.00
20	15	+1.25	+1.50	+1.75	+2.00	+0.50	+0.50
		+1.50	+1.50	+2.25	+2.00	+0.75	+0.50
21	12	+2.00	+2.75	+2.75	+2.75	+0.75	+0.50
		+1.50	+1.25	+1.50	+1.50	0.00	+0.25
22	15	+1.75	+1.50	+2.00	+2.00	+0.25	+0.50
		-0.00	-0.00	+0.50	+0.50	+0.50	+0.50
23	13	-1.00	-1.00	-1.00	-1.25	0.00	-0.25
			+1.00		+1.50		+0.25
24	12		+1.75		+2.50		+0.75

25	14	+0.50 +0.50		+0.75 +1.25			+0.25 +0.75
26	15	+0.50 +1.25	+1.00 +1.00	+0.50 +1.25	+1.00 +1.50	0.00 0.00	0.00 +0.50
27	15	+1.25 +1.25	+1.25 +1.25	+1.00 +1.75	+1.00 +1.50	-0.25 +0.50	-0.25 +0.25
28	15	+B.75 +1.00	+0.75 +1.00	+0.75 +1.25	+0.75 +1.00	0.00 +0.25	0.00 0.00
29	14	+2.00 +2.50	+2.50 +3.00	+2.25 +3.00	+2.50 +3.25	+0.25 +0.50	0.00 +0.25
30	12	+1.50 +2.00	+1.50 +2.00	+1.75 +3.00	+1.75 +3.00	+0.25 +1.00	+0.25 +1.00
31	11	+2.00 +2.00	+2.00 +2.00	+2.00 +2.50	+2.00 +2.75	0.00 +0.50	0.00 +0.75
32	13	+1.00 +1.00	+1.00 +1.00	+1.75 +1.75	+1.75 +1.75	+0.75 +0.75	+0.75 +0.75
33	16	+2.00 +2.00	+2.00 +2.25	+2.50 +2.50	+2.62 +2.62	+0.50 +0.50	+0.62 +0.37
34	14	+1.75 +1.75	+2.00 +2.00	+2.25 +2.25	+2.25 +2.25	+0.50 +0.50	+0.25 +0.25
35	16	+1.62 +1.62	+1.62 +1.62	+2.25 +2.25	+2.25 +2.25	+0.62 +0.62	+0.62 +0.62
36	13	+1.25 +1.50	+1.25 +1.50	+1.50 +1.75	+1.50 +1.75	+0.25 +0.25	+0.25 +0.25
37	17	+1.50 +1.50	+1.75 +1.75	+2.00 +2.50	+2.50 +2.50	+0.50 +1.00	+0.75 +0.75

		-1.00	-1.00	-0.75	-0.75	+0.25	+0.25
38	14	+3.50	+3.50	+3.75	+4.50	+0.25	+1.00
		+2.25	+2.50	+2.62	+2.75	+0.37	+0.25
39	13	+2.25	+2.50	+2.62	+2.75	+0.37	+0.25
		+1.50	+1.75	+2.37	+2.37	+0.87	+0.62
40	15	+2.00	+2.25	+2.37	+2.37	+0.37	+0.37
		+2.00	+2.00	+2.50	+2.50	+0.50	+0.50
41	12	+2.00	+2.00	+2.50	+2.50	+0.50	+0.50
		+2.00	+3.50	+2.50	+4.50	+0.50	+1.00
42	13	+2.00	+3.50	+2.50	+4.50	+0.50	+1.00
		0.00	0.00	-0.25	0.00	-0.25	-0.00
43	14	0.00	-1.00	0.00	-0.50	0.00	+0.50
		+1.25	+1.50	+1.87	+1.75	+0.62	+0.25
44	15	+1.25	+1.75	+1.87	+2.00	+0.62	+0.25
		+1.50	+1.50	+2.50	+2.50	+1.00	+1.00
45	15	+1.50	+1.50	+2.50	+2.50	+1.00	+1.00
		+3.50	+6.50	+4.50	+7.50	+1.00	+1.00
46	15	+3.50	+6.50	+4.50	+7.50	+1.00	+1.00
		+2.00	+3.00	+2.50	+3.25	+0.50	+0.25
47	15	+2.00	+3.00	+2.50	+3.25	+0.50	+0.25
		+1.00	+1.00	+1.50	+1.37	+0.50	+0.37
48	14	+1.00	+1.00	+1.50	+1.37	+0.50	+0.37
		+4.50	+6.50	+5.25	+7.25	+0.75	+0.75
49	15	+4.50	+6.50	+5.25	+7.25	+0.75	+0.75
		+2.00	+2.00	+2.00	+2.50	0.00	+0.50
50	13	+2.00	+2.00	+2.75	+3.25	+0.75	+1.25

reliance could be placed upon any attempt to record recession of the near point or loss in accommodation in these children and the observations made are based upon the skiascopic examinations following the use of the drugs. The ages of the children examined ranged from eleven to seventeen years. The cycloplegics employed were two per cent homatropin solution, without erythroxylin, and a one-fifth of one per cent solution of scopolamin hydrobromat. On the night preceding the examinations four drops of a two per cent solution of homatropin hydrobromat were instilled in each eye at fifteen minute intervals. The following morning four more drops of the same solution were instilled in each eye and the examinations begun an hour and a half after the last drop had been placed in the eye. Immediately at the conclusion of the skiascopic examination made under homatropin one drop of one-fifth of one per cent solution of scopolamin hydrobromat was instilled in each eye. This was repeated at the expiration of thirty minutes and a second skiascopic examination made an hour and a half after the instillation of the second drop of scopolamin. Each eye examined had received eight drops of a two per cent. solution of homatropin, four the morning of the examination and four on the preceding night, and two drops of the one-fifth of one per cent. solution of scopolamin solution preceding the second examination. There can be no reasonable doubt as to the establishment of complete functional inactivity. The complete detail chart showing the results of these examinations is too long to be presented here, but will appear in the printed transactions. The copy which is incorporated in this paper is available for inspection if any of the members desire it.

A brief review of the findings will be given. Of the one hundred eyes examined no skiascopic examinations were recorded in two eyes on account of the presence of congenital cataract. Of the ninety-eight eyes examined skiascopically the second examination following the use of the scopolamin revealed no change in six as compared with the findings made when the eyes were under the effect of homatropin alone. In fifty-seven eyes the examination under scopolamin showed a change in the skiascopic measurements of from 0.12 D up to and including 0.50 D. Twenty-three eyes gave a variation of from 0.62 to 0.75 D, inclusive. Ten eyes presented an increase in error of from 0.87 to 1.00 D, inclusive. Two eyes showed a variation of 1.00 D and above, the highest being 1.50 D increase in the error of refraction as determined by the skiascope. The use of homatropin in children proved equally efficient to scopolamin in six of the

ninety-eight eyes examined, inferior in ninety-two eyes, and superior in none. Sufficient evidence apparently to warrant the assertion that homatropin is not a reliable cycloplegic agent to use in children.

Conclusions: The reference in the first part of this report to the earlier work of Doctor Risley and others was made in order to bring out the fact that the cycloplegia produced by atropin was then and is now recognized as the standard of cycloplegia. The observations made on the action of hyoscyamin and homatropin show that at that time the necessity for a more rapid and less persistent cycloplegic was felt and the determination of the efficiency of the various substitutes for atropin was then attempted.

This report recognizes that atropin and scopolamin possess equal cycloplegic power and that they both may be accepted as our present day standards.

The results of the experiments in which homatropin and erythroxylin were used in solution and in the ophthalmic disc warrant the following conclusions:

1. One disc of homatropin and erythroxylin gr. 1/50 possesses greater cycloplegic power than do six drops of a two per cent. solution of the same drugs.

2. One disc of homatropin and erythroxylin is productive of a maximum cycloplegia in seventeen and one-tenth minutes less than the time required for the maximum cycloplegia resulting from the use of six drops of a two per cent. solution of the same drugs.

3. Homatropin and erythroxylin in solution did not produce a sufficient cycloplegia in sixty-four per cent. of the cases examined.

Homatropin and erythroxylin gr. 1/50 in the ophthalmic disc failed to produce complete ciliary relaxation in 36 per cent. of the cases examined, *but* in but four per cent. was this deficiency in cycloplegia greater than twenty-five one-hundredths of one diopter.

4. When homatropin and erythroxylin in solution or ophthalmic disc are used as cycloplegics, measurements of the loss in accommodation are absolutely necessary to insure against error.

The experiments performed in the effort to show the comparative value of homatropin and of scopolamin in children, show that scopolamin is the superior cycloplegic and that homatropin

is not to be relied upon. The toxic effects of scopolamin were observed in no case.

This report is but preliminary and the interpretation of the findings and the conclusions drawn therefrom may, in the final report, be somewhat modified when more cases have been studied.

DISCUSSION

DR. LUCIEN HOWE, Buffalo, N. Y.: It seems to me we are much indebted to the authors for bringing this very practical subject to our attention. If I might venture a word of comment, it would be that such measurements should be made on normal eyes rather than on those seen in the routine of practice. Moreover, as drops vary in size, we do not know how much enters the conjunctival sac or how much flows out from it, so for any such measurements we should use only carefully prepared ophthalmic discs. The effects of a certain definite amount of atropin and of several other drugs were published some fifteen years ago in the classic work Die Wirkungen von Arzneimitteln und Giften von Dr. L. Lewin and Dr. H. Guillery. Those results have been largely verified and new data have been added by a number of members of the Section on Ophthalmology of the American Medical Association who joined in a cooperative study concerning the ocular muscles.

It remains, however, an interesting field from which a harvest of important facts can be reaped. The writers are to be congratulated on the material which they give us now, and we hope for still more data in the future.

DR. EDW. JACKSON: Dr. Newcomb's work is of special interest to me, because it is in line with some I did about the time of the publication of Risley's paper. At that time I was impressed with the idea that for accumulating scientific data, it was important to eliminate all possible sources of variation and error; and all reports upon the relative influence of mydriatics should be from uniform applications. A Fellow of this Academy asked me to see a child in consultation. He gave the prescription for atropin one per cent, and that was to be put in three times a day. After some days of supposedly following directions, the pupils reacted freely to light, with only a slight difference in the size of the two pupils.

Donders observed years ago, it takes only one one-millionth of a grain of atropin to produce such an effect, and here was a child getting one per cent solution three times per day and the amount of the effect was barely perceptible. They had the solution along and I put a drop in the eye, and in ten minutes we had a wide dilitation. That illustrates the inaccuracy of application where the thing is put in the hands of the patient's family. This is the cause of endless errors. Where the instillation is made either by the operator, or some trained assistant or trained nurse, who does it in a certain way in all eyes and applies it accurately, that does away with this inaccuracy. I take it that is true of these statistics Dr. Newcomb has presented.

I was struck with the marked discrepancy between the effects of homatropin in the disc and in solution. Two elements come in with reference to the amount of time for producing the maximum effect. Of course a single disc is put in first, and the time measured from that. The 90 minutes from that corresponds to 60 minutes from the average time of instillation of the solution. Then a drop is not equivalent to a grain of water. As watery solutions are dropped, the number to a drachm differs from 75 to 200, and usually runs from 85 to 100; so that the proportion is not quite as he has assumed.

In comparative statements there is another source of inaccuracy. When you get the maximum effect, no matter how much more you pile on, you get no more effect. I made some statements in an address before the Section of the A. M. A. in 1895. By taking a minimum amount of the drug that will produce a noticeable effect, and then comparing the results, we find that homatropin is weakest, that scopolamin is far stronger. But where you get the after accommodation and measure it accurately, and have a certain number of trials of the same per cent, you will get relatively better results. The measurements Dr. Newcomb has made give much more accurate results than any studies based on clinical observation.

Dr. C. W. Hawley, Chicago: The paper we have just heard was incomplete indeed, but I think he has left the kernel out entirely. It is very nice to know that homatropin will not produce the maximum amount in the loss of accommodation. That is not what we are after. I think if he had taken another course entirely he would have given us something of real value. What we want to know is, what is the relationship between 0.5 D. of astigmatism under homatropin and a certain amount of astigmatism under atropin. That is the kernel of the whole thing. It makes very little difference in a child whether you have a diopter or a half diopter of hypermetropia. The question is, do you get sufficiently paralysis so you can do retinoscopy accurately. If so, you get the relationship between the astigmatism between atropin and homatropin. It is not hypermetropia that produces their headache, but the astigmatic error. The small difference between atropin and homatropin paralyzation would produce no effect, if we do a retinoscopy within 0.12 D. for the astigmatic error.

Dr. Linn Emerson, Orange, N. J.: Dr. Emory Hill of Chicago sent a questionnaire to a large number of teachers of ophthalmology several years ago.

The replies indicated that more than 90 per cent of these men thought a cycloplegic necessary for the fitting of glasses.

If that is true, and if homatropin is a reliable cycloplegic, why not use it?

In 1906 I conducted a series of 40 cases (published in Ophthalmology), in which after using homatropin, atropin was used t. i. d., for three days.

These cases were carefully selected, all being intelligent and having normal vision. In these 40 cases, one patient with six diopters of hyperopia, took plus .50 S. more in each eye under atropin than under homatropin; one took plus .25 S. less in one eye, and one took plus .25 cyl. more in one eye. All the rest were identically the same.

In Dr. Newcomb's cases it must not be overlooked that the ones in which homatropin *solution* was used, there was no cocain in the solution. Cocain accentuates the effect of homatropin. Homatropin is not always pure. Since I began making my own solutions I have had no unsatisfactory results. Another thing, drops are often not put in the eye properly. In my series of published cases all instillations were made by my own hand. The solution I use is cocain, 2 gr.; homatropin, 5 gr.; water, 5 drachms.

I often use atropin in small children, but in the clinic we use scopolamin as a time saver. In the past ten or twelve years, I have seen about six cases of scopolamin poisoning at the clinic. As a result I seldom use it in my office, since a red, flushed incoherent child causes the mother much alarm, and gives the use of drops a "black eye." Recently the comparative use of disks and solution in a small series of cases served to more firmly fix my prejudice in favor of the drug in solution.

Dr. Harry S. Gradle, Chicago: Dr. Newcomb brought out one

point in his paper that I think is valuable; the relative value of this and drugs instilled in solid form. The average drug put into the cul de sac in solution remains there about 8 seconds and is then washed out. Any drug so used in the conjunctival sac is there too short a time to be of maximum value. Wolff of Amsterdam recognized this four or five years ago and devised a means to overcome that, fluorescin zinc, which is soluble in one to one-thousandth in water or tears. He rubbed the powder into the cul de sac and allowed the tears to form a solution, keeping the eye bathed therein until it has been dissolved, which takes about twenty minutes. I have used it a great deal. We are now working on paraffin discs that will melt at about 36 deg. C., which will take 5 minutes to dissolve and contain 5/100 gram of silvol. If we use 5/100 grams of that or any drug in a paraffin disc, which will dissolve in five minutes, we will then keep the eye bathed in a 5 per cent solution of that drug for a period of 5 minutes, and it is easy to see this will produce greater results than if we put in a drop that will remain only ten seconds.

Dr. Greenwood: I wish Dr. Newcomb would take up with some of his confreres how much accommodation is paralyzed, how much can be demonstrated. Are we to believe that the act of accommodation occurs in all astigmatism? I do not believe that cyclopegics will develop a great many astigmatisms more than you can find by making careful preliminary tests as in my office always precede the use of a cyclopegic.

Dr. Newcomb (closing discussion): Dr. Howe brought out that the findings of this paper are probably not reliable on account of the fact that the abnormal eye was examined. This is true so far as the standard or normal eye is concerned. But these eyes were all ametropic, because we desired to bring out the effect on the ametropic eye, which is the eye we have to examine in our office. One one-hundredth will produce a relaxation. That can be further reduced if we accept the apparent proof, that 25 per cent of the disc and more of the solution escapes.

I agree with Dr. Jackson that the instillation should not be intrusted to any one other than yourself or a trained nurse or assistant. It is never proper to make instillation any place but in the office, nor is it necessary. In the cases reported, the instillations were made personally or by Dr. Larkin or the trained assistant.

In regard to time of maximum effect, it was reported 90 minutes following the instillation of the first drop but the maximum was also observed 180 minutes after the instillation of the first drop, but in no case did there follow an increase to exceed 25/100 D.

I do not agree with the criticism as to the size of the drop. Within a reasonable range it has no bearing. It will not be much more than ½ m. If small, you will lose some of that. The capacity of the cul-de-sac is 1 m.

I do not agree with Dr. Hawley that 1 D., more or less, in accommodation is inconsequent. I consider it of great significance in refraction. I do not believe that you can get even an approximate estimate of your astigmatism unless you have full relaxation of your ciliary muscle.

To Dr. Emerson I will say no attempt was made to determine the choice of cyclopegic. In the examination of the 30 the cocain was left out for the reason they were young ladies of 17, and I felt the toxic effect would have to be watched very closely. In a great many cases of toxic effects from drops in the office it comes from cocain in the solution, and for that reason it was left out. In regard to the scopolámin in this series, in three years I have yet to see a single case of toxic effects. The answer is that you use too great a dose.

I believe Dr. Gradle's suggestion of the paraffin disc with silvol he is now using is great, and I believe it will probably produce a greater cyclopegic than I have obtained with the gluten disc.

PRACTICAL CONSIDERATIONS IN CONNECTION WITH INSUFFICIENCY OF CONVERGENCE OF THE VISUAL AXES

J. M. Banister, A. B., M. D., F. A. C. S.
COLONEL U. S. ARMY, RETIRED
OMAHA, NEB.

By the term "insufficiency of convergence" is meant in this paper insufficient action of the adductor muscles of the eyes in securing and maintaining with ease the necessary degree of convergence of the visual axes in the coordinated muscular action required to secure single vision for points within infinity. A sharp distinction must be drawn between convergence insufficiency, in which single vision is possible under effort, up to a very finite distance from the eyes, and external strabismus, in which a fixed angle of divergence exists between the visual axes, which renders single vision impossible whether at finite points, or at infinity. Conditions of paresis are eliminated from this discussion.

Admitting, then, the existence of convergence insufficiency, as a pathologic entity affecting the visual apparatus, what is the essential nature of such condition? The adductor muscles, the ciliary muscle, and the sphincter pupillae are supplied with innervation through the third nerve, the ciliary muscle and sphincter pupillae being supplied by this nerve through the ophthalmic ganglion.

The nucleus of origin of the third nerve is situated in the floor of the fourth ventricle beneath the aqueduct of Sylvius. This nucleus, there being one on each side of the median line for its corresponding nerve, is a collection of ganglionic cells, from which the bundles of fibres, constituting the third nerve, proceed to the ocular muscles. Fibres ascend, also, from this nucleus to the angular gyrus of the cerebral cortex, which is supposed to contain the centres for the voluntary associated movements of the eye-balls (Bernheimer, Fuchs). Through a higher centre, not yet located, but which is thought to be in the angular gyrus, it is generally assumed that the convergence of the two eyes is so coordinated as to secure single vision for points within infinity.

Convergence is also associated with accommodation, both functions being, as before noted, under the direct control of

ganglion cells in the nuclei of origin of the third nerves, and coordinated by the action of a higher centre, or centres.

This relation of convergence and accommodation was forcibly dwelt upon by Donders many, many years ago in advancing his views concerning the cause of internal strabismus, and is familiar to every oculist. Any condition which may have the effect of altering this relation between convergence and accommodation, as uncorrected errors of refraction, for instance, may be sufficient to induce convergence insufficiency.

Landolt estimates that there must be in reserve for work at any given finite point, twice as much power of convergence as that required for securing single vision at that point, a fact which must be borne in mind in estimating the amount of convergence necessary for our patients.

Causes of insufficiency of convergence. The following are considered possible causes of this condition by various observers:

1. It may be caused by a lesion of the brain or spinal cord (Landolt).

2. It may be a result of the neuroses. Neurasthenia may be particularly responsible (Landolt).

3. Anemia, or some debilitating disease, may be the cause (Landolt).

4. A real weakness of the internal recti muscles of congenital origin may be responsible (De Schweinitz, Landolt).

5. Errors of refraction and disturbance of accommodative efforts may induce the condition (Landolt, De Schweinitz, and many other observers).

6. Faulty attachment of the muscles (De Schweinitz).

7. Excessive action or spasm of opposing and dominating muscles (De Schweinitz).

8. Disturbances of innervation (Gould, De Schweinitz, Tscherning, Hansen Grut).

While all of these assigned causes may play a more or less important part in inducing convergence insufficiency, the most important factors are now considered by most observers to be those connected with the innervation of the muscles connected with the function of convergence.

Hansen Grut and Tscherning attribute this insufficient convergence *not* to *absolute weakness* of the internal recti muscles, for if this were so, the associated muscular movements of the ocular muscles in other functions would be interfered with, but to *defective innervation*. Tscherning says in his Physiologic

Optics, "It is not in the muscles; it is in the innervation of convergence that we must seek for the cause of the deviation."

Symptoms: The symptoms enumerated here have been formulated from my own experience. Marked ocular and mental fatigue after short use of the eyes in near work, is generally the first symptom. The print may become dim, and the letters overlap each other, or become mixed. Upon looking at the hands of the watch, or the marks on the dial they may seem to broaden and then regain their normal width, and then to broaden and broaden again, showing a tendency to diplopia. As the condition becomes more established, increasing efforts of convergence will be necessary to avoid double vision, and after using the eyes for a short while in near work, a feeling of intense nervousness in the spine between the shoulder blades may manifest itself, with an impulse to throw away the book or paper under observation.

In walking, the ground at the patient's feet may seem to oscillate and giddiness may result, and a similar oscillation may be noted in looking at objects around the room when indoors. Headaches may be frequent, at times resembling migraine. Nausea and dizziness may result from close use of the eyes. In locomotion the patient may feel as though he were going to fall forward, or to either side. Tender spots frequently make their appearance along the spine in the cervical and dorsal regions, and paresthesia may manifest itself in the form of burning spots, or areas, on the arms and forearms, or along the spine. A feeling of fatigue and drawing just back of the mastoids is frequently complained of.

Very often in consequence of these nervous manifestations, the fear of organic disease may be induced in the mind, both of patient and attending physician. Great mental depression and hypochondriasis are prone to come on, and add to the troubles of the patient, until finally the victim may pass into a condition of almost confirmed invalidism.

These nervous symptoms are due to the great "nerve leakage," if I may be permitted to use such an expression, resulting from the never-ceasing spurring on of the flagging convergence, to avoid diplopia, and will disappear upon the correction of the convergence insufficiency.

Finally, in extreme cases, the positive convergence may be so weakened as to render single vision impossible for points within a useful working distance for any length of time.

Diagnosis:

1. Cover test. The use of this well known test for both distance and the near point, will serve at least to create a suspicion of convergence insufficiency in the mind of the examiner.

2. Examination to determine the *existence*, or *nonexistence* of *heterophoria*.

With the test object, a candle flame or point of electric light, at twenty feet, the use of the phorometer, or Maddox rod, will serve to detect a condition of heterophoria. In a case of convergence insufficiency, we may find perfect orthophoria, or there may be some degree of exophoria, or even of *apparent esophoria*. An exophoria would not be surprising from the nature of the condition, an orthophoria would show, of course, the possibility of maintaining a parallelism of the visual axes, but what would be the significance of an *esophoria*, which would seemingly be entirely out of place in a case of weakness of convergence?

This occurrence of esophoria for distance in unmistakable cases of convergence insufficiency for near need throw no one off his guard. The esophoria is *apparent*, not *real*, the convergence insufficiency being the *key of the condition*. My colleague, Dr. H. B. Lemere, and I have explained this seemingly anomalous condition, as follows: In the constant effort to maintain sufficient convergence to avoid heteronymous diplopia, a partially spastic condition of the internal recti muscles is induced, which would account for this seeming esophoria for distance. We do not consider that this spurious esophoria should be a bar to efforts to increase the positive convergence in the condition under discussion. It is a *result* of the insufficiency of convergence, not a definite, real state of muscle imbalance. Consequently in our efforts to correct the insufficiency of convergence in any case, whether by prism exercises or by operative procedures, we ignore such apparent esophoria, and find invariably that it disappears after the positive convergence has been brought up to the degree required.

This matter has been fully discussed by my colleague, Dr. H. B. Lemere, in a paper entitled, "Apparent Esophoria and Its Relation to Convergence Insufficiency," read before the section on Ophthalmology of the American Medical Association at the Minneapolis meeting in June, 1913, to which paper I beg leave to direct attention.

3. The determination of the *punctum proximum of convergence*.

It need not be expected that the power of convergence of

the visual axes may be determined with any degree of accuracy by the use of adductive prisms, with the test object at 20 feet. I am well aware that many ophthalmologists, whom we consider as authorities, have held that healthy eyes shold show *upon demand* a prism convergence for distance of 30°, or 35° to 50°, and that persons who cannot do this have convergence weakness. I must disagree with this dictum. Healthy eyes after training with prisms may no doubt attain this degree of adduction, but not at the first office examination in advance of such training. In 1897 I conducted a series of experiments upon the subject of the dynamics of the ocular muscles, making use of 100 healthy young soldiers of the regular army, who were in perfect physical condition, and who had never had a symptom referable to their eyes. Only one of these healthy young men was able to exhibit a prism convergence of 26°, the highest degree reached, the average prism adduction being 14.1°.

My findings upon the physiologic action of the ocular muscles determined at that time were presented in a paper entitled, "A Contribution to the Study of the Dynamics of the Ocular Muscles," and published in the Annals of Ophthalmology, January, 1898.

Among my conclusions formulated in this paper, was the following: "That the determination of the punctum proximum of convergence, and the calculation of the maximum convergence, after the method of Landolt, are the only true tests of the real power of convergence, or the positive convergence." My findings were afterwards confirmed by Flavel B. Tiffany of Kansas City, who repeated my experiments, by Lucien Howe of Buffalo, and by Hansell and Reber of Philadelphia, as can be seen by consulting the published works of these observers.

I have never changed my views since the publication of the paper referred to.

The determination of the punctum proximum of convergence is very simple, and requires no more complicated apparatus than the well known dot and line on a card, and a rule to measure the distance at which double vision results when the card is made to approach the eyes. Of course, in such a meeting as this, I need not explain further than to state what every oculist knows, that this distance from the eyes when divided into 100 cm. where expressed in centimeters, or into 40 inches when recorded in inches, will give the power of convergence in *metrè angles*.

Now we come to a very practical question; how much con-

vergence should a given individual have in order that near vision may be maintained with comfort?

Schuurman and Duane hold that the normal individual should see an object (as the dot) singly up to about 2⅛ inches from the eyes, which would be equivalent to a maximum convergence of 18.8 metre angles. Landolt, in his great work, "The Refraction and Accommodation of the Eye," places the necessary maximum of convergence at 9.5 metre angles. I am of the opinion that the exigencies and serious demands upon the eyes of our strenuous American Life, require a higher degree of convergence than that given by Landolt, while a lesser amount than the 18.8 metre angles advised by Schuurman and Duane would seem to be sufficient. In my experience 13 metre angles of positive convergence will furnish sufficient power of convergence to secure thoroughly comfortable use of the eyes in near work, and I have made this the standard in my practice. This would mean, of course, that the patient should see the test object singly at three inches from the eyes.

4. *The determination of the punctum remotum of convergence, or the negative convergence.*

After determining the maximum of convergence in a given case, and finding it so defective as to constitute a convergence insufficiency, the negative convergence, or power of abduction should be enquired into in order that the examiner may form an estimate of what part a possible over-action of the external recti muscles may be playing. Abductive prisms furnish a ready means for determining this point. All oculists know from experience that prism abduction unlike prism adduction, remains quite constant in healthy eyes, and cannot be appreciably increased by exercises with abductive prisms.

In my published experiments, the average prism abduction for distance in my 100 cases was 6.88°, or 7° virtually. The standard of 7° for healthy abduction has been generally accepted by the profession. To find the negative convergence in metre angles, divide the prism abduction by 7 as it is well known that 1 metre angle corresponds to 7° (prism).

If in a case of positive convergence much below the standard the negative convergence (abduction) should amount to 2 or 3 metre angles, one may suspect an overaction of the external recti muscles as complicating the case.

TREATMENT

(a) Any existing ametropia must be accurately corrected by lenses, and the patient be required to wear his correction con-

stantly as an essential of success. In myopic conditions, showing moderate degrees of convergence insufficiency, this may relieve the trouble, but in marked degrees of the affection under discussion, whether in myopic or hypermetropic states, other treatment will be required, as a rule. I consider prisms, bases in, combined with the ametropic correction contraindicated, and have not prescribed them for many years. The reasons for this are obvious.

(b) Training with adductive prisms and other exercises. Systematic training with adductive prisms of gradually increasing strengths, after the method of Gould of Philadelphia, may prove efficient in moderate types of convergence insufficiency.

The methods of training the adduction advocated by Worth are also highly beneficial as adjuvants in certain cases. Worth's amblyoscope I have at times found of service as a means of stimulating the fusion impulse, and thus improving the innervation of the adductive muscles.

These methods may be satisfactory in instances where the maximum of convergence does not fall below 6½ metre angles.

(c) Treatment by operative methods.

Where the maximum of convergence is decidedly low, say about 5 or 6 metre angles, especially if the negative convergence is comparatively high, operation will be indicated in the presence of marked nervous symptoms. Under such conditions, operation should be undertaken even if there should be an apparent esophoria. Operation will also be required where other methods do not secure results.

I am a firm believer in the value of the views of Landolt, enunciated many years ago, that in cases of insufficiency of convergence requiring operation, our operative methods should primarily be of the nature of an advancement of the internal rectus rather than a tenotomy of the antagonist. It will rarely be the case that a tenotomy of the antagonist will be advisable, and then only when the negative convergence is markedly increased. Some form of advancement being determined upon in a given case, what should be our method of procedure? I am an ardent advocate of securing the effects of an advancement by *shortening* the tendon by the use of a *tuck*. I have been performing this operation since 1898, and have never made use of the technical advancement operation for this purpose.

The "tuck operation," which in my hands has proved eminently satisfactory, is the operation brought forward by Dr. Francis Valk of New York in 1897, with certain modifications.

In this operation, the tuck is made with a single mattress suture of "0" or "00" chromicized catgut, and left buried, the flap of Tenon's capsule and conjunctiva being united over it by silk sutures, two generally being sufficient. The idea of the tuck operation was first suggested by Savage in 1893.

In performing this operation, I have found attention to the following points essential, viz: (a) The careful freeing of the tendon from Tenon's capsule, and separation of the belly of the muscle from the globe back to a point beyond the base of the mattress suture, in order that the tendon may be permitted to slide forward when the suture is drawn taut to make the "tuck."

(b) The passage of the ends of the suture through the upper and lower thirds respectively of the attachment of the tendon to the sclerotic embracing the dense episcleral tissue just at the tendon insertion, and the securing of a strong hold upon the belly of the muscle at the situation of the base of the mattress suture by weaving the suture in and out as it is passed through the muscle. These steps are necessary in order that the muscle included in the base of the suture may be brought up sharply against the attachment to the sclerotic, and held there without slipping.

In my experience, in a great many cases, a tuck so placed has invariably held. These are modifications of the original operation suggested by practical experience at the operating table.

Another modification, which has been utilized by my colleague, Dr. H. B. Lemere and myself, is the following, which we have found very useful: In case, after drawing taut and tying the mattress suture, an insufficient effect has been obtained, an additional effect may be secured by rethreading the needle upon one end of the suture, which has been left uncut, and passing the needle farther back through the belly of the muscle, and then tying to the other end of the suture left in situ. This makes a supplemental tuck, which, in our experience has always held firmly. The "hump" in the muscle resulting from the tuck atrophies in a very short while, and the tendon remains shortened in proportion to the amount of the muscle embraced in the mattress suture. This method has decided advantages over the usual technical advancement with a separation of the muscle from its attachment to the globe, and with a reattachment by silk sutures at a paint nearer the cornea, for in the first place there are no sutures to possibly cut through the ocular tissues, with a resulting slipping back of the tendon and loss of effect; in the second, the effect can be more accurately gauged, and if not suf-

ficient the accessory tuck can be utilized; and thirdly, since an absorbable material is used to make the tuck, there are no deep sutures to be removed afterwards.

This operation, performed on one eye with the proper amount of muscle incorporated in the tuck, will in the great majority of cases be all that will be required. In very rare instances, with a strongly overacting external rectus, and a markedly increased negative convergence, the greatest effect to be secured by tucking one internal rectus may not be sufficient. Then after a short interval of ten days or two weeks, a similar operation may be performed on the internal rectus of the other eye, and the full effect required be thus secured. In extreme cases it may be necessary to also perform a tenotomy of the antagonist, as before noted. Such cases as the latter are desperate, and the patients will gladly submit to additional operative measures in the hope of getting relief. Local anesthesia, except in the case of very young nervous individuals, is, of course, indicated. In addition to the instillation of cocain in the conjunctival sac, I make use of a subconjunctival injection of a 1 per cent. solution of novocain around the tendon and belly of the muscle.

CONCLUSIONS.

The views advanced in this paper may be formulated in the following conclusions:

1. That convergence insufficiency of the type discussed in this paper is a definite pathologic entity.

2. That this state is due to lack of proper innervation of the adductor muscles, which innervation is under the control of a special cerebral centre.

3. That the use of adductive prisms can not be relied upon to furnish an estimate of the power of convergence in any given case.

4. That the power of convergence must be determined by finding the punctum proximum of convergence, and estimating the maximum convergence in metre angles.

5. That the negative convergence should be determined by abductive prisms as furnishing an important indication of a possible overaction of the external recti muscles, the normal negative convergence being about 1 metre angle.

6. That the normal maximum of convergence may be placed at about 13 metre angles, and that any marked falling below this standard is positive evidence of the existence of convergence insufficiency.

7. That if the maximum of convergence does not fall below

6½ metre angles, exercises with adductive prisms, and other exercises, to strengthen the adduction may effect a cure of the convergence insufficiency through stimulation of the innervation.

8. That if the maximum of convergence is as low as five metre angles operation will be necessary as a rule.

9. That the existence of an apparent esophoria, in the presence of a definite convergence insufficiency, is no bar to efforts to correct the latter either by exercises or by operation, as the convergence insufficiency is the key of the condition.

10. That operative measures should be of the nature of an advancement, or shortening of the internal rectus muscle, rather than a tenotomy of the antagonist, the latter expedient being reserved for rare and very extreme cases.

DISCUSSION

Dr. E. C. Ellett, Memphis: What little experience I have had along the lines of this paper is in full accord with it up to a certain point. Testing the ability of the muscles to overcome prisms, base out, does not give much information, since this trick can be quickly learned and the prism adduction doubled or trebled in one sitting. The test I use most is the simple one referred to of measuring the near point of convergence with any small object, such as a pencil. If this is 8 cm. or less, equivalent to a convergence of at least 12 M. A., I have not considered the case as one of convergence insufficiency.

I am sorry that I cannot duplicate from my experience the good results following any treatment of any form of muscle imbalance. At intervals, stimulated by such a paper as the present one, I have gone into the subject afresh, but my experience is that careful refraction, good judgment in prescribing, and attention to such matters as the general health, illumination and the relief of manifest, though slight, ocular diseases, especially conjunctival irritation, has given relief when it was obtained, and when these measures failed, no amount of muscle exercise, prisms or operations have succeeded in a sufficient number of cases to encourage a further trial of them. I cannot explain this and have often wondered at it, but that has been my experience.

In addition to this, I have seen a number of patients with this and other muscle troubles without any symptoms at all.

Dr. Walter B. Lancaster, Boston, Mass.: I was very much pleased with this paper. My experience at Mineola with the large number of ophthalmologists in the air service has given me an unusual opportunity to become familiar with the general practice of ophthalmologists in the matter of muscle testing. It is still generally the practice to test convergence power by prism convergence. That is, the amount of prism, base out, that can be overcome in looking at an object across the room. Both these gentlemen have condemned that method; and I condemn it too. If you want to test convergence, let the patient look at a suitable object, which is gradually brought nearer and nearer his nose, and watch him to see how near it can be brought before one eye diverges or he says he sees double. I wish to call attention to the following point. A person with insufficient convergence can often converge very well if he has the power of throwing himself into the effort. A patient whose endurance is markedly diminished (neurasthenic, for example), may make a deceptive

showing. We can judge that by the way the eyes act as they converge. If there is a plain manifestation of effort, we can discount a little; otherwise, we can add a little.

The writer said nothing about general treatment. Most of these cases are rather neurasthenic or below par, and that sort of treatment is important. I have seen good results from use of prisms, base in, in some of these cases.

Dr. Meyer Wiener, St. Louis: Two points I want to touch upon: One is that to my mind the writer has left out the dominant or most prominent symptom which occurs in this, and that is the symptom of sleepiness on close use of the eye. I find almost invariably the chief symptom of which he will complain is that he becomes sleepy when he reads. We find this in students who are not able to study because they go to sleep, and this symptom disappears when they stop reading.

As regards prisms, I agree that I have never seen a prism base in do any permanent good in this condition. Use a 3 deg. prism, base out, and tell the patient to use it for one minute at a time, four times a day, and increase one minute each day, and he will use this where he will not use the amblyoscope, which is hard to use. This does not interfere with his work, as he uses them only for close work, and after he gets to thirty or forty minutes he need not time it any more, but uses it for all close work and within three or four months usually gets results.

Dr. Patton: I had the pleasure of seeing Dr. Banister work, and wish to emphasize the things he said. We have all been proud of the result he has been able to get in this work of muscle study and improvement, and the results obtained from his treatment by operation for the correction of these symptoms has been very satisfactory. Not only has he been able to correct conditions of the horizontal muscles, but he has also successfully corrected other muscles as well, which I hoped he would mention in his paper.

Dr. H. B. Lemere, Omaha: I used to believe what Dr. Ellett states, that if the refraction were corrected everything had been done to correct the symptoms of asthenopia, and that muscular defects were an almost negligible factor. After I became associated with Dr. Banister, almost ten years ago, and observed his diagnosis and treatment in these cases of insufficiency of convergence, I came to realize that the symptoms given in this paper were very real, that they were the result of insufficiency of convergence and that the treatment outlined in this paper restored these people to usefulness. An observation of these cases for several years has convinced me that this condition is a pathologic entity, and that the oculist who refuses to recognize it cannot do his full duty to his patients.

Dr. Hunter H. Turner, Pittsburgh: Dr. Banister did not mention the one element which in our experience is most frequently associated with this interesting condition in the relation of cause to effect. In our own practice the routine procedure for years past has been to send these patients first of all to a competent rhinologist for an opinion as to the condition of the accessory nasal sinuses, the ethmoid labyrinth especially.

It has been our privilege to treat many of these cases, varying from a slight to an almost complete suppression of the convergence amplitude. In as astonishingly large proportion of cases the amputation of the tip of the middle turbinate with currettement of the ethmoid has caused a very prompt disappearance of the convergence insufficiency and all indications for operative interference so far as the ocular muscles are concerned.

DR. LUTHER PETER, Philadelphia: One of the practical methods I found in determining the convergence near point is the little electric lamp in the ophthalmoscope. You can determine the near point, and you can determine whether they can maintain the convergence for any length of time.

DR. BANISTER (closing the discussion): I have been using this method of operating for the cure of convergence insufficiency since 1898, and I well know that I have secured most satisfactory results in very many patients who, otherwise, would have gone on to serious invalidism.

When we have definite and highly satisfactory results regularly, following the use of a certain surgical procedure in the case of a distressing ocular condition, there is reason to cast adverse *theory* aside.

DISTURBANCES OF THE HEART AND LIVER BY LOW GRADES OF ASTIGMATISM

E. L. JONES, M. D.
CUMBERLAND, MARYLAND

From the army which was recently drafted in the United States, a large number who had passed perfect on examination, had to be dropped because of the fact that when they were put to the actual task of drilling and other physical exercises, their hearts would fail to hold up, and they became winded and exhausted, and yet showed nothing demonstrable on physical examination to explain why they were not as good as the others who stood up under similar conditions. In an article entitled Cardio-Vascular Examinations of Fifty-five Thousand Recruits, at Camp Travis, by Geo. E. Fahr, *et al.*, *Journal A. M. A.*, January 18, 1919, this class is characterized as the constitutionally inferior or "third raters." While explaining nothing, cardiologists have termed this condition, neurocirculatory asthenia, and as far as the essayist is able to gather from his reading, they have nothing of value to offer for its relief.

For more than a decade cases of this type in civil life have been observed by the essayist, whose number would run into hundreds if limited to circulatory symptoms alone, and thousands if many of the associated symptoms later on to be narrated were the objects of consideration, which were largely or totally relieved by a thorough correction of errors of refraction. The title of this paper is intended to emphasize that any or all astigmatism present must be corrected to the finest degree possible as to strength and axis of cylinder, else the small error remaining for the eye to overcome will still permit the continuance of symptoms. This does not mean that the other source of refractive eye strain, hyperopia, does not play its part and need correction, which should be done, neither does it mean that myopia, not a source of refractive eye strain, is not to be reckoned with. But associated with myopia and hyperopia of all degrees up to exceedingly high, and in cases of supposedly noncorrectible irregular refraction, there is usually more or less astigmatism, sometimes very difficult to establish as to exact amount and axis, unless the examiner is dominated by a fixed conviction that the symptoms point to astigmatism, and he will not quit until it has been worked out, and

worked out right. I have found the motto to presume that astigmatism is always present until its absence is indisputably proven, to be a safe guide, and in very few cases presenting sufficient symptoms to call for examination, can its absence be proven. It was said in the early days of modern refraction, when visual acuteness was the only desideratum, that astigmatism under 1. D. did not amount to anything; and without wishing to disturb the Shade of the great Donders, it is claimed he considered half a diopter as the minimum of value. This is still largely true in nonpresbyopes, from the standpoint of attaining sharpest vision possible; but where that search ends, the search for eye strain so called, properly begins. It would be desirable if a better term could be substituted for "eye strain" say eye-stress, as the former term to the laity conveys the meaning of conscious effort on the part of the eyes, whereas it is oftenest totally unconscious. Another error to be combated in the minds of the laity and general medical profession is that all cases of eye-stress must produce either pain, discomfort or weakness of eyes, or some of the old classic symptoms of headache, nausea or nervousness. I wish to state with all emphasis possible that more people in my belief suffer *from* the eyes, than *with* the eyes, and my hope that the day will come when every patient affected with a persistent vertigo, pain or drawing in the neck or shoulders, unexplainable general fatigue, nervous depression, gasing stomach, cardiac asthenia, or cold, clammy feet, realized after going to bed by putting them against a warm body, will be referred to the most painstaking oculist available, for that careful search for astigmatism, either alone or buried under a smaller or larger amount of far or nearsightedness, the correction of which usually brings relief after enough months elapse to permit the dying out of these vicious symptoms after removal of their cause. Not to inform patients of this necessary lapse of time is likely to cause them to discard our efforts as futile, bringing loss to themselves, and disrepute to their oculist. For many of the earlier years of my career, following the lead of such authors as I had been able to read or study, I held the belief that astigmatism not reducing vision in presbyopes, especially advanced presbyopes, was of little or no consequence. And that presbyopia when fairly complete, had so set the accommodative mechanism that eye stress could not result. To me now the doctrine is Anathema-Maranatha; one that should be utterly stamped out, regardless of any theoretic bolstering up, when cold facts prove how much somatic disturbance may come from astigmatism, especially of low degree, at advanced ages. As

some of the tenets herein set forth, together with their attempted explanation, will no doubt challenge the credulity of some, and the antagonism of others, it is desirable to go into certain details that would otherwise seem unwarrantable. Lieut. Col. R. H. Elliott, in a paper on errors of refraction published in the *British Journal of Ophthalmology* for June, 1918, says, "Let each one tell what they actually do in their practice and not what they would like to do, or what they would like others to think they do;" and further on quotes Kipling's lines:

"But each for the joy of the working,
And each in his separate star,
Shall draw the Thing as he sees It,
For the God of Things as They are."

In the first place, the fitting of glasses, aside from simple presbyopia, should be considered as much a part of the practice of medicine, as diagnosing diseases, prescribing drugs, or doing minor surgery. In many patients the issues of being able to enjoy good health and successfully pursue happiness, are as much dependent on a proper refraction as the outcome of some of the most ambitious operations of major surgery, where the issue of life itself is not involved. But sad to relate, in the esteem of much of the laity, and some of the medical profession, getting glasses is only a simple matter of purchase, with the purchaser as the chief arbiter of what is to be done, and how to do it, and they speak of Dr. "Jewelry Store Clerk," or Dr. "Gold Glasses for a Dollar," in the same terms as the medical doctor who concentrates his energies and thoughts on the organ of vision.

In late years much stress has been laid on disturbances of the ductless glands, in the practical investigation and application of which Dr. Crile has played a prominent part. In his masterful contribution on the Kinetic Drive he has shown the effect on these of infections, of loss of sleep, and great fear or long continued anxiety or depressing emotions, and as the ductless glands and sympathetic nervous system are the drivers of the heart, whatever stimulates or inhabits these must bear out its effects on the heart. To his list of disturbers, in the essayist's belief, should be added another, as potent as any, and probably more common than all of the others, viz: eye strain. Since the promulgation of our present day beliefs as to hyper- and hypothyroidism, the similarity of these in many respects to long continued eye strain, has forcibly struck him, and caused a belief that the thyroid was being held blamable for a number of sins chargeable to the prime cause of eyes under stress, although they work out their harm by

causing secondary derangement of the ductless glands; chiefly the thyroid, and probably the adrenals and pituitary. These cases early in their evolution probably first pass through a short phase of hyperthyroidism symptoms, as in the case of a girl of 12, who just came in while this paper is being written, on account of mild discomforts in eyes with nervous excitability. Her pulse on admission to examination room, after a short conversation on commonplace things is 136; after sitting an hour waiting on cycloplegic drops, it is 120, and pounding like a trip hammer, which her mother notices in her sleep. The more common cases have passed from hyper- to hypothyroid symptoms of nervous depression; in a recent case of a young married woman apparently in the best of health, and certainly looking it in features and form, the pulse was 64. She had been sent by her physician to seek relief from headaches, and inquiry developed she also had dizziness, neck and shoulder pain, was nervously depressed, tired, easily winded, and had palpitating heart, the first sounds of which were rather faint, but no bad feelings or weakness about the eyes. She had undergone a thyroidectomy seventeen months previously. When she came back five weeks after having astigmatism corrected, she was already beginning to feel better in several ways, pulse was 76, and heart sounds more distinct to the best of the observer's ability to be unbiased in judgment.

A misconception universal amongst the laity, and general amongst physicians, is that eye stress only comes from near use of the eyes, and is dependent on the amount of hours of close work, and should therefore find its chief sufferers amongst bookkeepers, students, stenographers, seamstresses, etc., and should be relieved by giving up these various callings for life in the open. A more pernicious and misleading doctrine was never promulgated. The majority of the cases observed have been in the wives or daughters of farmers, miners, carpenters, railroaders, mill workers, etc., who give of their time much more to domestic duties than to reading or needle work than do those who deludedly call themselves the intellectuals, and be it said to their credit they make much better patients, for they really want relief, are willing to admit the doctor knows better than they, as to what glasses to wear and when to wear them; and they have the self-mastery to make themselves do what is hard and unpleasant at first, in order to get an ultimate good.

Women are much more frequently subject to eye strain symptoms than men, notably in regard to nervousness, the neck and shoulder pain or drawing, and the cold feet. The man more often

controls his nerves and gives a condition of nerve tension, or a "feeling he has to sit hard to hold the lid down." But when a man does have the neck and shoulder pain, which is a liver symptom, or cold feet, a heart symptom, he usually has them bad. It is a common occurrence to have a well developed husky farmer or mechanic, etc., come for some minor discomfort of the eyes, and reveal upon inquiry that he is easily tired and winded by a short amount of physical effort, and has been puzzled as to why it should be; or has been taking general or heart tonics without avail. These are often presbyopes with reading glasses or bifocals giving perfect vision, but poor satisfaction. A recent illustrative case is a man of forty-eight, healthy and robust in looks, leading an active out-door life, who complains for many years with eyes that burn, itch, redden, pain from bright light, blur on short use, and water too readily; frequent headaches, occasionally sick headaches, very dizzy, severe neck and shoulder pain, easily tired and winded, with palpitation of heart, and feet cold up to his knees. He states that he frequently bandaged his knees to keep them warm. The glasses he had been wearing were lost when an attack of dizziness struck him while driving on a mountain side, and the car with himself and wife rolled down the bank, spilling them all out. This patient had quite a common condition that may never appreciably blur vision, but is prolific of eye strain—mixed astigmatism of low degree. In the *Journal of the A. M. A.*, August 17, 1918, Roby and Boas give the results of studying a series of cases of Neuro-circulatory Asthenia at Camp McClellan, in which they conclude exercises accomplish little or nothing towards overcoming the weakness, but are of great value in establishing the diagnosis. They refer to accompanying dizziness, to emotional stress. In discussing this paper, Sir James Mackenzie, of London, speaks of some of these cases having cold extremities, at times getting flushed. It is quite common to have some eye cases complain of hot burning feet, under similar conditions that others do of cold.

The Archives of Internal Medicine for December, 1918, contain a lengthy article with many tables and statistics by Friedlander and Freyhof, entitled an "Intensive Study of Fifty Cases of Neuro-circulatory Asthenia"; also on "Tachycardia of Unknown Origin," by Barringer. These articles emphasize the associated symptoms of dizziness, nervousness and cold, clammy extremities, and the fact that many of the cases were below par since childhood. The same journal for March, 1919, contains a lengthy article, also many statistics gathered at Camp Lewis, American

Lake, Wash., on "The Relative Frequency in Recruits With and Without Thyroid Enlargement of Certain Signs and Symptoms which Occur in Neuro-circulatory Asthenia," in which they started out with a belief that statistics would show the condition more often associated with enlarged thyroid, but the result, as far as any differences went, was in favor of a greater prevalence where there was no thyroid enlargement. To show that their clinical description conforms to the types of cases which have been relieved by correcting astigmatism carefully, several quotations will be made. "The symptoms were precordial pain with dyspnea and palpitation on moderate exertion, such indications of vasomotor instability as dizziness, flushing and fainting, and a variety of other complaints, all pointing to a state of excessive reaction of the nervous system to psychic or physical strain."

"Dyspnea, palpitation, and precordial pain are taken as cardiac symptoms. Dizziness, flushing and fainting, are taken as indications of vasomotor instability. Mental irritability, emotionalism, apprehensions, depression, excitability and exhaustion, and "shakiness" after exertion or excitement, were all grouped under the heading of nervous instability."

"Now one of the outstanding clinical features in both conditions, though this is more especially true in neuro-circulatory asthenia, is the multiplicity of subjective complaints, and the paucity or even absence of objective evidence. So it comes about it is mainly on symptoms and not on signs, that diagnosis rests. And the special characteristics of the symptoms is the wide field they cover. It is not only the cardiac or the vasomotor or the nervous system which is at fault, but all three together. "What has been termed the 'Symptoms Complex' that is, an association in the same individual of symptoms of cardiac, vasomotor and nervous instability, is as often seen in nonthyroid as in thyroid cases."

These cases in civil life are not rareties, like catalepsy and botulism, but when looked for, will be found commonplace as corns and bunions. When it is considered to what extent they may be relieved by exactly correcting all errors in their refraction, and proper glasses worn all the time for a long enough time, it makes the remark of one of America's foremost surgical Ophthalmo-Oto-Rhinologists publicly expressed some years ago that the refractionists claim to cure everything from headaches to hemorrhoids with glasses, seem as full of truth as of sarcasm, for it can safely be said that by this means many ills from vertigo in the top of the head to coldness of the feet, with clamminess of their soles, are permanently eradicated.

In addition to the hyperthyroid and emotional stress hypotheses, Major Carroll, in an article on neuro-circulatory asthenia, in the *American Journal of the Medical Sciences* for July, 1919, seeks to establish, as have also some of the other authors quoted, chronic infections as a cause. There is no doubt that all of these play a contributing part on a system which has been put in a condition of lowered resistance by some previously acting cause. Few things of slow development come from a single condition, but a combination of conditions and circumstances, and a heart or a mind collapsing suddenly is more often due to long and slowly acting unrecognized undermining, than the immediate precipitating cause. If the matter could be tested out, it would probably be found a large percentage of shell shock cases, as well as the neuro-circulatory heart cases, had been undermined by a long acting eye strain. As corroborative of the essayists claim that eye strain symptoms affecting the heart are not more common amongst close workers with the eyes, the following quotations from G. E. Hein, based on studies of neuro-circulatory asthenia, at Camp Sherman, are taken from the *Journal of the A. M. A.*, for January 25, 1919.:

"Three hundred men returned to the development battalion from the various line organizations, because of complaint of 'Heart Trouble' throw some light on this problem. The men passed apparently normal, were placed in organizations, found unable to drill, rejected as unfit for military service, and referred to the development battalion. It is interesting to note that 154 have had symptoms for five years or more, some insisting that they have always had distress.

"As shown in chart 1, the largest number of cases occurred amongst farmers, with laborers next, the two classes forming 56 per cent. of the total. The clerical positions came next, with 17 per cent. Giddiness, present in 242 cases, was the most common symptom; on prolonged or sudden severe effort, dyspnea occurred in 239 instances. A hike, or double quick time, sent these men out of formation in short order."

An impressive illustration of the effect of correcting astigmatism in these heart cases, and the permanency of the relief, occurred some years ago in the person of Mr. H., a man of athletic build and exemplary habits. He was raised on a farm, doing all kinds of work pertaining thereto, and working with milling when the farm work did not demand his attention. After manhood he qualified for, and entered the legal profession. After getting into his early forties his heart began to functionate poorly, and he developed an anemia, morbid fears, etc., to that extent that for several years he never began a day with any feel-

ing of assurance he would live through it; did not dare to lock a door for fear he would drop dead and some one would have to break the door in; dreaded to undertake the simplest duty of his profession; for fear he might not live to finish it; if he started across the street to the barber shop, he wondered if he would live to get there, and seated in the chair he would think, "this barber will look up, and when he looks down again, he will be looking at a dead man." His home physician could make out no organic heart trouble, and finally referred him to Dr. Thayer, in Baltimore, who also pronounced him free of any organic heart trouble on three separate occasions, and advised him to return for a season to the simple rural life, living in the open, attending as hostler his own pony, etc. He also went to Florida for a few months as a relaxation and diversion. His eyes had never given him the slightest trouble in feelings or function until at the age of forty-five he began to have considerable trouble skirmishing for lights and focus, in other words, normal presbyopia. On May 13, 1910, at the age of forty-six, he applied to the writer for optical aid. No symptoms of eye discomforts or headaches, etc., simply had to hold the print off, and then could not see the two finer blocks of Jaeger types. An examination showed a considerable amount of mixed astigmatism; the cycloplegic drops were used, and as is generally the case, eliminated a considerable part of the minus element. The examiner, having already for some years been convinced of the disturbing action of astigmatism on the heart, especially as exemplified in chronic cold feet in women of a most robust type, as well as the delicate looking, remarked, "Mr. H., I think we have the 'nigger in the woodpile' that has been causing all your heart trouble." Such has proved to be the case, for with constant wearing of glasses, to which presbyopic addition was subsequently made, he soon threw off his disabilities, and so remains to the present, which he fully believes is due to eye correction. Last year he applied for life insurance, and the Company held up his application because of a loss of weight of twenty pounds from his erstwhile average, and asked for an explanation. His answer was that the country was at war and "long on lawyers and short on farmers," so he went back to the farm and worked off that twenty pounds. They took him. The anemia referred to has often been noted and it is no rare thing to see it vanish as rapidly after eye correction, as it does in other cases when the cause, such as malaria, sepsis, or hook-worm, etc., is removed. Likewise, patients under their normal health weight, often gain flesh with the same rapidity. Where the anemia and

loss of weight have been marked, it is sometimes hard to recognze the patient as the same person after a few months. This is because the nutritional system is upset by the disturbances of the liver as hereinafter to be set forth, in the writer's belief.

At the Missouri State Medical Meeting, *Journal A. M. A.*, June 28, 1919, discussing "So Called Irritable Heart of Soldiers," Dr. Lyter says:

"After studying the subject in the military camp at Camp Custer, Mich., I am convinced that the syndrome, which was first described by Da Costa, during the Civil War, and by the French, English and American Physicians during the recent war, is not a cardiovascular disturbance primarily, but the disturbance of the autonomic and sympathetic nervous system."

Dr. Bliss says:

"An internist in France insisted that all these cases were hyperthyroid, while I insisted that relatively few were hyperthyroid. They are constitutional cases. You cannot make soldiers out of these men. No form of treatment changed these individuals, either physically or mentally, so as to enable them to be good soldiers. The important point to recognize is that they are constitutionally inferior, and are not capable of such restoration as would make them efficient men."

Dr. Neilson says:

"When the first soldiers were being examined in St. Louis, I went so far as to accuse someone of giving these young men thyroid extract. We put many of them into the Army. Some came back with 'neuritis,' some with 'hyperthyroidism,' and some with 'constitutional disorders.' Later I decided to put these individuals into limited service, but I found that the limited service men worked just as hard as the regular soldiers, so we decided to send them back to their own work. We do not know what is wrong with these people, or that there is anything wrong with them, but I believe there is something behind it. I am not so enthusiastic as to attribute all these disturbances to the ductless glands."

Time and again have patients of this type been observed by the writer, who applied either for minor discomforts about their eyes, or in their opinions, things which might be due to eyes, when inquiry revealed that they were either always tired, or became easily exhausted, and lost their wind from the slightest exertion, when their appearance indicated they should measure up to full standards of strength. Not a few have come for aural troubles, and in a purely accidental way, spoken of how tired they always were, how quickly exhausted, etc., and have no complaint whatever as to comfort or endurance of vision, and yet a painstaking correction of refractive errors, oftimes exceedingly small and hard to fix, would relieve them of their asthenia. In many of these cases vision is absolutely normal, and the eyes reject all

glasses indicative of ametropia; but the use of a cycloplegic will often reveal a surprising amount of concealed error, even up to the age of fifty or beyond. On the other hand the error may be so small that vision under cycloplegia is normal, and apparently no error to tests made with no more than ordinary care, but by taking sufficient pains, a very low cylinder can be definitely proven to be called for, and just this class of cases have presented some of the most phenomenal results. A few years ago a civil engineer, aged thirty, was complaining in the presence of a railroad official, who had himself, by accident, fallen under eye treatment which relieved him of these mysterious fatigue symptoms, and was "tipped off" to have his eyes investigated. He had in addition to a general fatigue beyond reason, several other symptoms of eye strain, and as is usual with the writer, no importance was attached to the fact that the vision was supernormal and tests for error repudiated, but when under a cycloplegic vision was 20/16, and all glasses for a time rejected, things began to get interesting. By much persistence, the presence in one eye of one-quarter of a diopter of astigmatism with axis at off angle, and in the other a like astigmatism with equal spheric error, was finally established. It was explained to him he must wear glasses all the time if any good was to be expected. Meeting him on the streets some months later, he was observed to be much improved in appearance and weight and he was commended for wearing the glasses all the time. His reply was, that he would wear glasses all over him if necessary to get the good they had done him. There are some detractors of the value of exact correction of errors, who say much of the good observed is due to suggestion on the part of an enthusiastic refractionist, and expectancy on the part of the patient. This criticism is readily answered by the havoc played with many patients who have been relieved, when one cylinder gets thrown a few degrees off axis, and patient still thinks his glasses the same. Such patients will some times say, "I can not wear my glasses, and I can not go without them." In older days with flat lenses, this often came about by a glass falling out and being put in backward, or having the frame bent; in latter days, by accidental rotation of a round lens. Another source of trouble is replacing lenses from the broken pieces, when either the axis of a recognized cylinder is slightly misplaced, or a weak cylinder, in combination with a strong spheric, is altogether overlooked. An illustrative case is a man of forty, of athletic proportions, who came six years ago for sundry vague complaints about eyes of several years duration. Inquiry revealed he was always tired, no relief from vacation, and had to force an interest in his busi-

ness, etc. Eyes tested normal, but under cycloplegic, right showed one and one-half spheric with one quarter cylinder axis 135, and left one spheric with 0.62 cyl. axis 45, which were given for constant wear. After the usual difficulty of getting used to them for distance, he was relieved in body and mind, and got well for two years. His old symptoms then returned, and he came for re-examination. It was observed he had other glasses, which he said were made on the formula of those first worn. Inspection showed the cylinders had been omitted, and when glasses were supplied by correct fomula, he got all right again. At the expiration of another year, he indulged in the new style round lenses, and symptoms again drove him to report for relief, when lenses were found correct, but axis of cylinders reversed. They were set right and marked, and no trouble has been reported since. The majority of these cases of muscular asthenia, neurasthenia, and psychasthenia, if questioned, will also be found to present evidences of neuro-circulatory asthenia, as exemplified by being easily winded, palpitation of the heart from slight effort, clammy hands and feet, and the divers other symptoms detailed in the previous quotations descriptive of this condition. These conditions are much more common amongst women than men, and if a regiment of "Amazons" was organized, a large percentage would drop out when put to drilling from getting winded. To see these Amazon women who are always dead tired, with pain or drawing in the neck and shoulders, easily winded, with fluttery hearts, gasing stomachs, and cold, clammy extremities, measure up to their looks after having an astigmatism corrected, is more suggestive of a play that is staged, than the realities of life. They will often say on presentation, that the worst of it is, they look so healthy and strong that no one will believe how tired they are, and how miserable they feel. On the other hand, some of the opposite type look as miserable as they feel, and in such the improvement in looks, color and weight may be observed *pari passu*, with their feelings. One not infrequent after result is that those who had settled down into a condition of confirmed celibacy feel so buoyed up in health and spirits, that they view life from a different angle, and embark on the sea of matrimony. Nearly two decades ago the essayist began to note, more frequently in women, in his eye strain cases, the presence of a pain or pulling in the neck, or shoulders, or between the shoulders, not rarely running out into the arm, or even to the finger tips, accompanied sometimes by a tingling or numbness in the arm which has been pronounced by some neuritis. This pain also in some instances runs

from neck to ear, or continues on from ear to eye. However old, or well known this symptom may be to others it is only in very recent years the essayist can recall having seen any reference to it in such promiscuous articles as he has been able to peruse, as for instance in the report of Major Newcomb in the *American Journal of Ophthalmology* for May, 1919, of the Army Service, where it is referred to as the "check-rein" symptom. It is not mentioned in Stephenson's "Eye Strain in Every Day Practice," which covered the literature of the subject up to date of its publication four or five years ago. In seeking its explanation, the essayist came to the conclusion it was a distress signal of the liver; the older works on medicine abounded in references to pain in the shoulder as a symptom of liver disease. Anatomists tell us the parenchyma of the liver has no sensory nerves, but only sympathetic fibres, but that these sympathetic fibres anastomose with the spinal sensory nerves, and it is most likely by this means the protest of the liver is registered against a factor disturbing its normal functioning. By this same inhibition of hepatic functioning is also plausibly explained the gasing stomach so commonly due to eye strain in elderly people of both sexes, but probably more common in females. In presbyopes, who having gotten age glasses, find them unsatisfactory, it is one of the very commonest of symptoms, and usually diminishes or goes away when the causative antigmatism is properly corrected by glasses worn absolutely all the time except when patients go to bed to sleep. It is likewise the essayist's belief that the headaches and sick headaches recognized for two generations as coming from the eyes, and the vertigo equally common, but not so generally admitted as an eye strain reflex, are directly due to the inhibition of hepatic function by eye strain, and are consequently exactly the same in nature as the acute bilious attacks due to other transient causes putting the liver out of commission for the time being, such as getting overheated on a full stomach, etc. Inasmuch as Dame Nature finds relief from emptying the stomach under these conditions by vomiting, she tries the same tactics in the headaches due to eye strain, thus explaining the nausea or vomiting of sick headaches. On February 15, 1910, a buxom matron aged 39, came because of sundry discomforts in the use of her eyes, and inquiry revealed she had for several years suffered from a severe pain under her right shoulder blade, which remained, much to the puzzling of her surgeon after he had removed a large number of gall stones by operation, other symptoms due to gall stones having vanished. The essayist remarked he had for some years

been interested in the similarity of certain symptoms arising from gall stones and eye strain and hers would be a good case to try them out separately. She showed some manifest error but much more under a cycloplegic, and surprised and pleased her oculist by wearing full correction without the usual kicking and protests about the annoyances of breaking the eyes to the glasses. When commended for this, she said the glasses were doing too much good to kick about. That before life did not seem worth living; the pain was gone, and even her children noticed such a change as to say: "Mamma your disposition is so much improved since you wore glasses." On the other hand, parents have been heard to remark, "And the child's disposition is so much improved since wearing glasses." Everyone knows how a person's disposition is influenced by the state of the liver, which the ancients recognized in coining the word Melancholia—Black Bile. When this liver is goaded by a gastro-intestinal irritant, the grouches are most readily removed by a mercurial, followed by a saline; when goaded by a never ceasing eye strain, it is like a therapeutic miracle to see the despondency, pessimism and unreasonable irritability clear away under proper glasses, like mists before the rising sun when aided by a gentle breeze. Dr. Gould, to whom the world owes such a debt of gratitude for extending its knowledge of the far-reaching effects of eye strain, said, many years ago, when the prohibition movement had not taken any active form, that eye strain caused as much discord and domestic infelicity as liquor, and he also spoke of its producing abdominal symptoms the same in some respects as certain surgical conditions. In his series of Biographic Clinics, which were read by the essayist in anticipation of the preparation of this paper, to see in what respects we had independently arrived at similar conclusions, he shows the life tragedy of some of the world's great characters, authors, scientists, musicians, etc., and their long and futile efforts to be rid of sufferings, the relief of which in present-day patients by properly fitted glasses is a matter of daily observation with oculists who believe that proper refraction demands the same care and effort as does surgery, or anything pertaining to the healing art. Most of his subjects studied are known to fame, as Carlyle, Huxley, Spencer, Darwin, etc., but during the fifteen years these books were on the essayist's shelves, he was often perplexed as to one, and mentally would say: "Who in the 'blankety blank' is Nietsche?" When the great world cataclysm broke loose in 1914, the papers were full of the effect that the teachings of Nietsche had had on the ideals and policies of a certain Nation which had

run amuck, and when we read of the sufferings of the poor fellow (since peace we must not say devil), from symptoms clearly due to eye strain, we can well see how a properly fitted pair of glasses might have toned him down from his wild vagaries to milder doctrines and thus made his impress upon history more to his credit. The essayist has attempted, as far as opportunity offered, to read Dr. Gould's publications from their beginnings, and while not able to follow him in everything, wishes to publicly take off his hat to him in recognition of the fight he has made for better refraction, often not with the help of his chosen profession's votaries, but in spite of their opposition or even ridicule. To Mr. Ernest Clarke in London, such recognition is also due. To Robert Morris, a noted surgeon of New York, is due the credit of having for some years past written of, and taught by lecture, the similarity of eye strain and gall stones in producing symptoms to that extent that he frequently referred cases coming to him for operation, to the oculist, and thereby had their symptoms relieved. Some years ago a series of these cases treated by Dr. Alger, when sent by Dr. Morris, was reported upon, and the memory of the essayist runneth to the effect that one of these patients after having been relieved for a long time had a return of symptoms, and felt sure he was in for operation that time, when investigation showed he had permitted a high priest of the optometry cult to tamper with the holy axis of the sacred cylinders, or something to that effect, fixing same to suit his own belief. A restoration to the real needs of the case again cured the patient as in the first instance. While not wishing to undervalue the questions to a patient as to the feelings and performance of the eyes, headaches, nervousness and sick stomach, the essayist feels that if he were limited as to the number of questions that might be asked especially of those near to, or having reached the presbyopic age, they would be: Do you have vertigo? Do you have neck and shoulder pain (mostly adult women)? Do you have a gasing stomach? Are you despondent, or easily or always tired, or easily winded, with cold or clammy feet, or maybe hands as well as feet? Are you troubled with insomnia, etc? That insomnia is one of the results of eye strain has long been known, but it is questionable as to whether the frequency with which it can be cured or ameliorated by exact refraction, glasses to be worn constantly, has been appreciated by the bulk of the medical profession. It is, however, a symptom which lingers a long time before loosening its grip from its victim. The most plausible explanation of why a patient with a clear conscience and a placid mind should roll and toss a

good part of the night away vainly wooing Morpheus, is probably found in a short quotation in a recent issue of the *Journal of the A. M. A.*, to the effect that "Some physician (name not recalled) claims that two-thirds of the cases of insomnia are due to disturbing sensations from the abdomen, the chief being flatulent dyspepsia." The essayist is in no position to verify this claim, but granting it to be true, it is but another indictment of the culprit eye strain for disturbing an otherwise peaceful liver, which in turn permits an irresponsible stomach to gas as much as the unrestrained fermentative processes may compel.

In discussing the origin of vertigo, the older medical works had much to say of plethora, and disorders of the stomach and liver, while the latter day works speak of high blood pressure, arteriosclerosis, and aural troubles. It seems to the essayist that in late years the current literature on vertigo from aural origin to that from ocular origin is about in the proportion of an unabridged dictionary to a pocket edition, while from his observations the reverse is really the case. Patients with hardening of the arteries and vertigo to the point of complete incapacitation for the ordinary tasks or pleasures of life, have been relieved of the vertigo by correcting astigmatism, often buried under a lot of farsightedness for which they had for many years worn bifocals, or in those having in the glasses they had been wearing an astigmatic recognition which was not correct as to strength and angle. By reason of the abundant literature on aural vertigo, a number of these cases have been referred for ear treatment, but cured by attention to eyes. One old lady of sixty-seven had suffered severely from vertigo for thirty years, so much that her physician considered it Meniéres' disease; she was wearing spheric bifocals. On correcting a moderate amount of complicating astigmatism, she soon became entirely free of her dizziness, and wrote a few years back that she had had only one bad spell in three years, which she attributed to overloading her stomach during a hot spell of weather.

In one instance a patient went around a big circle, ending where he started, to find relief of a vertigo so severe as to cause him to frequently fall. On May 17, 1913, he, a mill roller, aged 46, came for sundry discomforts about eyes and head; in his record appears the expression, "Possibly nerve tension in a phlegmatic subject." Under cycloplegic drops he was given for constant wear a moderately weak sphero-cylinder correction to be worn all the time. Like the large majority of humanity, until shown the contrary, he thought glasses were only for near use,

and acted accordingly. His nerve tension and vertigo continued so bad his medical adviser told him that a long vacation was necessary to prevent a breakdown, so he laid off three months, and went to Philadelphia where he once lived. While there he consulted the now Associate Professor of Practice of Medicine in the University of Pennsylvania, for the dizziness, etc., and was advised to have his ears investigated as a likely cause, which he said he would have done when he returned home. He was quite dull of hearing in both ears from scarlet fever in childhood, but no discharges. On hearing his story, the examiner asked, "Where are those glasses fitted you?" "At home," he replied, "I use them when I read." He was made to understand they were for all seeing, as well as reading, and found that upon wearing them constantly, his dizziness left him, and he has had no further trouble up to the present.

In numerous instances patients have refused to believe the constant wearing of glasses necessary, usually claiming they could not wear the glasses, enduring their symptoms months or years, before settling down to make themselves carry out instructions which brought the desired relief. One man wrote that "For a year after getting glasses he could not wear them; he kept on getting so drunk (dizzy) he had to be hauled home several times a month. He then wore glasses as directed and for several years had been rid of his trouble." His lens was only one-fourth of a diopter cylinder in a presbyope. Another old gentleman was given bifocals, the far part being weak cylinders. He insisted upon using them only when reading, and was incapacitated for several years thereafter from all work by dizziness. A certain surgeon consulted advised a cranial operation, which frightened the family so much that they brought him to the oculist for a last look. He was advised to wear the glasses all the time for some months before submitting to any operation, with the result that he soon got all right, and has so remained for eight or ten years past. These cases in which vertigo is a prominent symptom are legitimately a part of the subject under consideration, inasmuch as the contention is made that the vertigo is due to hepatic inhibition, and not to high blood pressure, arteriosclerosis, or aural disturbance, in cases relieved by glasses, although the conditions enumerated may be contributing factors. Reference has previously been made of the similarity of eye strain to the fundamental emotions of fear or the struggle to preserve life by fight or flight, as portrayed by Crile, which applies to animals in general and their effect upon the ductless glands; but in the domain of the

higher emotions, which pertain to the human animal alone, the similarity is more marked. It has always been one of the shortcomings of medicine that only the vegetative and sexual systems were given due consideration, while the emotional nature was largely ignored. When the profound and far-reaching effect on the functioning of the individual organs, the supply of nervous vitality, and the body strength, weight and nutrition, of such emotions, violent or long continued, as homesickness, remorse, humiliation, thwarted ambition, financial reverses, disappointment in love, etc., is considered, it will give a conception of the power of eye strain to produce these same effects, and the system upon which these emotions and strain work are the same—the heart, liver and ductless glands. The extremes of cardiac response to the emotions range from the ancient Greek who dropped dead from joy on hearing his son had won the Olympic games, to a noted financier a few years ago, who is said to have slowly died of humiliation at having been badly buncoed by a financial adventuress, the story of whose workings was in every paper in the land. Eye strain, like the emotions referred to, is the greatest waster of nerve energy, like a short circuited battery, a leaky tank, or a flat tire, when it comes to what ought to be there, not being there. Courage and resolution, the will to do things, to enjoy living, etc., depend upon the proper abundance of nerve energy, and when this is sufficiently sapped, the opposite manifestations will occur, just as sure as one end of a see-saw goes up, when the other comes down. Hence, the expression of an irresolute person as faint hearted, or in modern slang, weak-kneed, or having cold feet. How we can find almost daily in our eye strain cases the weak heart, weak knees and cold feet has herein been narrated. How many patients, if asked, will say they have no "Pep," to use another modern phrase; how many of them get it back, and how grotesque it seems to them that it could have come from their eyes, is illustrated in a letter from a young country woman a good many years ago, who had been asked to report on all the symptoms which had been written into her record. One sentence ran—"I do not have the headache any more, nor cold feet, Ha! Ha!"

The extreme misery, pessimism, and morbid fears that are born of an exhausted nervous system, are inconceivable by one who has not experienced them, and indescribable by one who has. Herein we find no doubt, as has been suggested by Gould, and also an English author whose name can not be recalled, the explanation of so many otherwise unexplainable suicides, usually

attributed to ill-health, when the subjects were to others apparently not the subjects of ill health. Time and again have these eye strain cases, relieved by proper glasses, been heard to remark: "I feel so blue, and tired, and generally miserable, that if it were not for my family, or other obligations, I would rather be dead than alive." One woman, whose optimism refused to be squelched, said in reply to a question, that she told her husband she would be too tired to die. As a chain breaks in its weakest link, so it is with these cases of stress to the breaking point, a question as to the weakest link; so some break up as myasthenia, some as neurasthenia, some as psychasthenia, and some as neurocirculatory asthenia. On the other hand, how often do we see cases which have broken from other causes, such as influenza, various grave illnesses, or surgical operations, which fail to convalesce according to program or expectations, after the lapse may be of many months, in which correction of an eye strain, may be not realized as such by the patient, enables them to rapidly regain the health, strength and happiness which they apparently had been hopelessly denied, and this applies not only to the young, but also the middle aged, and often the old. During these periods of lowered vitality, patients are more prone to tuberculosis, hence relieving eye strain may lessen its incidence; or in its early stage may enable the vital forces to successfully combat it, as claimed by Dr. Park Lewis and Dr. Gould.

Several valuable papers were presented at the last meeting of the eye section of the A. M. A., as to the symptoms and methods of correction of eye strain. To this the essayist would add as his contribution his firm belief in the necessity of a cycloplegic in almost all eye strain cases up to an age far beyond what is taught by most authorities. Thousands of hours have been expended in making tests before and after cycloplegia to determine the relative differences, which might have been saved to one who was satisfied with noncycloplegic findings, and the summing up of it all is that without the drops most of the material for this paper in cases beyond forty-five years of age, and that is where their greatest number lies, would have fallen flat. The solution of choice is an approximation of a three per cent homatropin hydrobromat, with a slight dash of cocain, made freshly every few days, and used at intervals of ten minutes for six times, while the patient is waiting, the tests never to begin earlier than one hour from the first instillation. Another vital point is the arrangement of test cards and lights, the essayist believing it essential that the room be so darkened that no impression will be made

on the eye except from the test letters, and this of course calls for artificial illumination, with no lights shining into the examined eyes from the front, nor deflected from the back. White letters on a black card, and this card on a much larger blackboard for a back ground is used as the first stage of testing, working out the refraction as carefully and thoroughly as possible. Recourse is then had for the final testing to a little device bought many years ago and not mounted up for several months, because it was thought to be only a scientific toy, but experience has proven it to be a veritable "life-saver." This is one form of the small black boxes, containing letters on a roller, exposing only one line at a time, and operated by a cord extending across room overhead to the tester's chair. By taking only one letter, preferably square cornered, in the finest line that can be seen, it is possible to do much more accurate work in ascertaining the proper lenses or combinations, than by the card which permits other sizes and lines to be seen at the same time; but its far-reaching value is in the certainty with which the exact axis can be located, by taking the mid-line between the two points in which blurring first occurs when rotating the cylinder each way. So often does it show the axis of cylinder, the most vital point in refraction, sufficiently different from the open card, as to have insured failure to get desired results from the open card tests, however carefully made.

When we consider that with correct lenses the misplacing in one eye only, not to mention both, of a 1 D cyl. 5 degrees, a half diopter 10 degrees, or a quarter diopter 20 degrees, may insure failure, because of leaving enough stress to continue symptoms, and that the differences shown by these two methods often exceed that amount, we can well appreciate the value of the more accurate method. A goodly percentage of the essayist's records state "Open card axis wrong by so many degrees." A certain woman, of robust physique, and normally even tempered, complained amongst other things, of being so emotional that she was ashamed of her conduct before her children. She had worn weak cylinders for many years. On retesting a slight change was made in only one cylinder, as explained to her. Some months later, in an appreciative letter she wrote, "I don't care how little a change was made in my glasses, it has made a big change in me."

As illustrating the importance of having an axis exact, and the necessity of cycloplegia at an age much beyond what is usually taught, the following case is cited: Mrs. B., age between 54 and 55, although looking well, has for many years been a semiinvalid. For these years in addition to sundry discomforts

of the eyes, she had suffered almost constantly from headaches, often sick, dizziness forcing her to sit down, neck and shoulder pain, extremely nervous, tired, depressed, sick stomach, gasing stomach, cold feet, poor sleep, bad dreams, etc. She had been wearing for several years, from one of the most careful oculists in Maryland's chief city, right eye Sph. + 2.0, combined with cyl. + 0.50, axis 135; L., S. + 2.0, combined with cyl. + 0.50, axis 45, with cements + 2.50 added. An independent test, as is often the case, led to exactly the same glasses as the patient had, but so firm was the essayist's belief that the symptoms pointed to the eyes, that the test drops were used, and the axis of the right eye was found to be 120, and the left 30, which lenses were given. A little short of five months later she was again seen, and had nothing to fuss about except local irritation in eyes; something over a year later, virtually relieved of all symptoms except itching of eyes.

We do not have eye strain symptoms to any extent where vision is very dull both far and near, and it is the essayist's belief that such cases as the above would get rid of their aches and pains by going without glasses altogether, sacrificing all distinct vision, but this, of course, educated and intelligent people would not consent to do. It is his belief, that as in the moral world a half truth may be worse than a whole lie, so in an incorrect refraction, giving dull eyes a sharp vision, with some uncorrected cause of eye strain to be overcome in securing this vision, is worse than to endure the inconveniences of dull vision, if something must be sacrificed.

Opportunity has not been offered to study if there be any relation between eye strain and essential bradycardia and essential tachycardia, but it seems worth looking into. In the summer of 1916, an exceptionally large, robust looking farmer, aged 60, who had been so affected as to be a source of much anxiety to himself and family, was put to bed in the hospital by his physician, for some days, and then referred, with a diagnosis of Adams-Stokes disease, for eye examination. He had no eye symptoms, but because of his heart he was made to wear the correction of an astigmatism of small degree with some hyperopia likewise of small degree, and whether due to this, or treatment, or rest, or kind Providence, he, before a great while, got able to attend to his accustomed duties.

Things handed down by tradition have an easy road to travel, whether true or not, while new observations, even if true, must expect to travel the rocky road of doubt and opposition. A min-

ister, single and care-free, aged 54 years, came because he had broken his spheric bifocal glasses, and wanted new ones. He had accepted a modest rural charge in hopes of recovering from a nervous breakdown, with insomnia so severe that he went fourteen consecutive nights without sleep. He had been securing sharp vision with spheric lenses; tests on open card misleading. By the cabinet test he was found to have in each eye a moderate spheric, combined with a cylinder of one and a quarter diopter, axis 105. Asked the cause of his breakdown he said, "overstudy." The essayist is not a chance taker, but as to the cause of this man's breakdown, he would bet heavy odds on astigmation as against too much pondering on Jonah and the whale. Not rarely has he told women patients that to make such eyes as they had do sharp seeing, required more vital expenditure than to bring up a family of six children, and do all the work. A physician friend, sturdy of body, and philosophic of mind, who had referred many patients because of general symptoms, on reaching the usual presbyopic age of 45, began to have an interminable and unexplainable fatigue, not relieved by rest or a good vacation. Investigation showed astigmatism with acute far vision; under drops, three-quarters of a diopter +, axis vertical. The correction of this brought such complete relief, that he remarked in a gathering of medicos that he had been hearing a lot of talk about these awfully tired people being relieved by glasses, but that before he experienced it he thought they were mostly "fish stories."

When we consider the depressing effect of astigmatism, especially with tilted angles, on organically sound hearts, it will be interesting to observe the effect of its correction in cases with organic disease, but still able to "carry on." For instance, there has just come to the essayist a large, healthy looking man of 56, clerk of a county court, who was satisfied in the main with the plain presbyopic glasses he had, but wanted a pair of larger lenses. Questioning showed moderate discomfort in eyes after all day use, slight vertigo, nervousness and insomnia, cold feet and easily winded on exertion. Both his family physician and a consultant had pronounced his heart much enlarged with altered sounds, which were very easily observed by the essayist. His right eye took a cylinder of + 0.75, axis 15, and the left eye the same cylinder, axis 150, which were given in bifocals, never to be taken off except on going to bed to sleep; not to lie down for a rest without glasses. As to the severity of vertigo, a number of cases have been observed where it was practically the only symptom manifested, and yet sufficient to make the patient bedfast; some-

times for days at a time not being able to sit up, and yet, after correction, in a surprisingly short time manifest improvement, and ultimately a cure; some before, and others many years after presbyopia. The following case is illustrative of vertigo with several other classic eye strain symptoms: A very frail woman, aged 39, after having been thoroughly examined by an internist and a surgeon, was referred for eye examination. She spent most of her time in bed because of the dizziness, and could not walk across the street without support, and required a taxi to bring her a very short distance to and from the office. A statement of her physician that she even fell "out of the bed," she vehemently denied, saying she only fell "off of the bed." She had the neck and shoulder drawing, was extremely tired, especially in the back and legs, bad stomach, poor sleep, and cold feet. She had been wearing spheric lenses for ten or more years. Under drops her correction was Right S. + 0.75, combined with cyl. + 0.62, axis 75; L. S. + 1.0, combined with cyl. + 0.75, axis 105. In due time after wearing these her symptoms gradually wore off, she became cheerful and able to attend to her household duties, and when seen about fifteen months later, looked better in every way, had no complaints, and had risen from 84½ to 104½ pounds in weight.

Eye testing would be a simple matter if answers always were exact and consistent—as easy as measuring calico with a yard stick, or buttermilk with a quart cup. But they are often inconsistent, contradictory, and misleading; we not only must reckon with ocular fatigue and exhaustion, with fixed or momentary amblyopia, but with brains which can not keep a fixed attention for any length of time, or are "amblyphrenic;" hardly able to judge whether two sticks are parallel or crosswise; and answers, just as witnesses giving testimony in courts, must each be judged for their worth or worthlessness, and all evidence taken and sifted as to its value, before the examiner reaches a conclusion. And when he thinks he is about through, he must be prapared and willing to go over it all again; if evidence at the last seems to knock out the previous conclusion. In other words, for finding the small error, or the larger error to an exact degree, he must be a genius in the sense of Edison's definition of genius—one-third inspiration and two-thirds perspiration. Not only are a number of the essayist's records marked, "By extreme care and pains," but some of them, "By sweating blood," get so and so; and that by no means pleasurable process will not be indulged in

by one who does not put refraction on a pedestal, as one of the solemn obligations of a physician to his patient.

His final trial comes in inducing or persuading the patient to wear glasses all the time, which almost invariably cause a distance blur, or distortion of relations or dimensions of things seen. No amount of explanation or forewarning that these things are to be expected, and must be endured until nature can adjust to new standards, seems able to overcome the acquired, nay—even hereditary belief—that the sole and only function of glasses is to make things looked at seem clearer. One means which has been employed for many years is to keep on hand an abundance of spheric and cylindric specs with round lenses so the axis may be set at any angle, and lend each patient an approximative correction to begin wearing while the eyes are under the effect of the drops, and keep them until permanent glasses are secured, which in the practice of the writer is usually several days, which helps the eyes to adjust to lenses while still under the cycloplegic. Another is to furnish each patient a glass cleaner on which is printed: "Remember: Glasses that are given for anything except old age or short-sightedness are hard to get accustomed to, and cause annoyance and confusion at first. Wear them as instructed and allow the time specified before passing judgment. If glasses are gotten to relieve certain symptoms, judge by these, and not by the sight. Be patient."

While the concluding pages of this contribution are being written, a patient has come in who well illustrates the "before and after taking" of this phase of the subject. In the early summer of 1918, Mrs. Blank, age 51, was taking treatment for aural trouble, and on every visit poured forth a tale of sundry woes and complaints, and queries as to what she might do to be rid of them. She was regularly told they pointed to her eyes, but as she was the possessor of a pair of Kryptok bifocals, she felt, as do most others, who have purchased glasses with which they can see, that source of trouble had been eliminated. No effort was made to induce her to take eye treatment, as she was one of those petulant, nervous or rather nerveless people who have little power by force of will to do anything which runs counter to the feelings at the time, and she was flatly told she would not make herself wear the glasses, even if they would ultimately relieve her. Of course she said she would and desired that matters proceed. She was wearing for distance each eye S. + 0.50, with S. 2.25 added, in meniscus Kryptoks. She had sundry eye symptoms, as burning, itching, watering and pain from bright lights; pain in head,

dizziness, neck and shoulder pain, running at times to ear and on to eye, very nervous, depressed, tired, sick and gasing stomach, car and movie sickness, poor sleep, cold feet and was losing flesh. Under cycloplegic drops, on August 2, 1918, her correction was R. S. + 1.0, ⊃ cyl. + 0.50, axis 90; L. S. + 1.25, ⊃ cyl. + 0.75, axis 90, which were ordered in distance only, the presbyopic addition to be made after she shall have gotten used to far glasses. The essayist then left for a month's absence, and on receipt of her glasses the patient reported to the office attendant full of complaint and lamentations that she could never wear the glasses and wanted them taken back. Some while after his return, she came with the same complaints, having really made no serious effort to wear her glasses, and wanting to return them. Matters were explained to her again, and she was told politely that the glasses were not returnable, and that the bill for services and glasses would be collected by legal process, and the best thing for her to do would be to wear them and get her money's worth. Being of a frugal turn, this argument had its effect on her flabby will power. When next seen on September 19, 1919, the transformation was equal to a shifted stage scene; she wore "glad raiment," carried a kodak, and smiled and laughed as though nothing was lacking to complete her happiness. In spite of the absence of presbyopic addition her eyes were comfortable, and no trouble about reading when print was fair sizes; headaches, dizziness, neck and shoulder pain, tired feeling, gasing stomach and cold feet all gone, slept sound as a log, had been on an excursion probably 125 or more miles away the Sunday previous with no sickness or fatigue, looked several years younger, ever so much more amiable, and had gained twenty-seven pounds in weight.

When we consider what a transformation in one's life, the uprooting of a small astigmatism can make, we may well conclude that one in the search for it should have what is something worth searching for, the convictions of Columbus, and in finding it, if need be, the patience of Job.

DISCUSSION

Dr. Allen Greenwood, Boston: I am indebted for the present opportunity of opening the discussion of this paper to a previous paper of my own on "Ocular Vertigo." In that paper attention was called to the fact that vertigo was more commonly the result of errors of refraction than usually supposed, and it was particularly pointed out that the usual error in such cases was an astigmatism of moderate degree, with oblique axes, needing very careful fitting.

In the majority of these cases of vertigo there were minor symptoms similar to those pointed out in Dr. Jones' paper, but they were so overshadowed by the primary symptom, which was in all cases cured or

ameliorated by proper glasses, that no special mention was made of them.

I think we are all indebted to Dr. Jones for his pointing out the great necessity for a careful correcting of all astigmatic errors in all patients, and I am sure we will all find if we follow this out, that, in common with Dr. Jones, our patients will be relieved of many symptoms.

I cannot, however, agree with Dr. Jones' theory of the action of astigmatism on the liver and the consequent causation of dizziness, nausea, vomiting and other symptoms of nerve exhaustion. The theory advanced in my paper on "Ocular Vertigo" seems to be more likely. That is, that dizziness and various nerve and stomach symptoms are the result of reflex nerve disturbances produced directly from the nerves that control the eye muscles. In the case of vertigo, it certainly seems more likely that there is a direct reflex nervous disturbance from the nerves controlling the eye muscles to the nerve centers of equilibrium, and as these nerve centers are closely associated with those connected with the stomach, heart and many other organs, it is but natural to suppose that disturbances in these organs may result in the same way.

I also would not ascribe the entire symptom complex directly to an astigmatism, but consider the eye strain as resulting from nature's attempts to overcome defects, only one of the contributing causes in the extensive symptom complex which Dr. Jones describes.

In many cases it is, of course, true that eye strain is perhaps the predominating cause, and on its removal the patient is able to overcome other causes and proceed to a rapid recovery.

In view of the great number of people who have minor grades of astigmatism, even with axes oblique and anisometropic and never have any of the symptoms ascribed to eye strain, we must, perforce, conclude that in cases where the eye strain precipitates trouble the patient's body metabolism was in some way below normal, and that the relief of the eye strain is one of the measures for decreasing the overload which the body is trying to carry. Many patients who have such disturbances precipitated or aggravated by eye strain have undoubtedly been placed in this condition of faulty metabolism through some disturbance with the internal secretions.

We are also indebted to Dr. Jones for giving us helpful suggestions in the methods of examination, but I personally, do not wholly agree that it is necessary to carry the use of cyclopegics to the ages in which he uses them. I have found from long experience, comparing my results with and without cyclopegics, that by careful examination and reexamination, I can obtain practically the same results in the majority of patients over thirty-five.

Dr. Jones has mentioned one case where his first examination reveals no astigmatism, and the cyclopegic revealed as astigmatism of plus .62. By following out the methods of examination which I am accustomed to, I doubt if an astigmatism of .62 would go undetected. Under cycloplegia I frequently find it necessary to add more plus sphere, but I very seldom have to change the amount of the astigmatic correction, or even its axis. This may be wholly due to the fact that I have trained myself to examine the patients over and over again, until I feel reasonably sure of the amount and axis of the astigmatic correction. The above remarks apply particularly, of course, to the class of people who are presbyopic or beyond, in which Dr. Jones uses a cycloplegic. If it were my routine to use a cycloplegic in all refraction cases of this class, then my preliminary tests would be superficial. I reverse this order, however, and make exhaustive tests first, only using cycloplegics where evidently necessary; thus I find my results with or without cycloplegics very close together.

The great lesson taught us by Dr. Jones is not that heart and liver

disturbance may be caused by the nerve overload produced by a constant eye strain, but that these disturbances which have not been relieved by a hastily fitted pair of glasses may entirely disappear when all of the hidden astigmatism has been corrected and the proper axes found.

Dr. Lancaster: It is evident from the remarks that the idea that accommodation causes astigmatism is deep rooted. There is not time to go into that now. (See Transactions American Acad. Ophthalmology and Oto-Laryngology, 1915, p. 167.) I wish to call Dr. Jones' attention to a method of getting the axis of astigmatism by the use of Dr. Green's astigmatic charts. They must be used in the right way, using sufficiently strong plus lenses so that the individual cannot accommodate to advantage. If he uses the chart with lines every ten degrees, he can get the axis with great accuracy and measure the amount with surprising precision in an intelligent patient. It is especially useful where the error is small.

Dr. John Green, Jr., St. Louis, Mo.: Dr. Lancaster, with characteristic modesty, has spoken of certain astigmatic charts as "Green's Charts," whereas in reality they were devised and described by him in a recent issue of the Academy's transactions. Ever since I began using "Lancaster's" charts, I have been enthusiastic about them and can heartily endorse what their author has said in regard to the accuracy with which one can determine the axis and amount of astagmatism.

Dr. Lucien Howe: I am sorry to touch a discordant note, but I think it is a decided step backward to ascribe all manner of symptoms to forms of eye trouble without first being absolutely certain of our data. A very decided protest, therefore, should be made against the conclusion that vague and uncertain conditions of the stomach or so-called nervousness or even supposed love affairs can be cured by the correction of a low grade of astigmatism. Such theorists discredit us all.

Dr. G. W. Spohn, Elkhart, Ind.: The essayist has a right to make assertions and no one has a right to deny, unless he can prove his assertions. How do we know that the error of refraction is not the cause of the disturbance of the liver? I do not believe it, but I cannot prove my disbelief. How do we know but there is a relation existing and that the reflex comes by way of the spinal nerve? I do not think we have a right to criticise the essayist unless we can prove that he is wrong and that the critic is right.

Dr. Jones (closing discussion): It is true that many cases of astigmatism do not present any symptoms. To those opposed to wearing glasses all the time I say as long as it does not bother you, you need not bother it. But bear in mind if one of these things does come on to you, that it is probably the effect of the uncorrected astigmatism. Some never have symptoms until they have a serious sickness and then months after will say they never had their health since they had this sickness. After abdominal surgery they will fail to convalesce and once they are down they find they have some of these symptoms and on examination they are found to have astigmatism. It is stated in the paper that few things occur from a single cause. Dr. Greenwood speaks of examining the patient over and over. The majority I have live away from the little city where I do, and want to get the next train out, and I can't in all these cases do it, and say for them to come back. I have got to do what I consider the surest thing. Sometimes they are of that mental calibre they have not the judgment to tell us whether two sticks are parallel or crosswise and I have to take this into consideration.

I am glad for what Dr. Howe said. I said I would be pleased for favorable or unfavorable comments. I do not know as much as the rest of you, and all of us together do not know some things we would like to know. When we see a thing, let us try to explain it.

THE OPERATIVE TREATMENT OF PTOSIS

WALTER B. LANCASTER, M. D.
BOSTON, MASS.

It is not the purpose of this paper to discuss all the score or more of operative procedures which have been proposed for the treatment of Ptosis, most of which I have never tried. I propose to describe the four operations which seem to me the most satisfactory.

Types and Degrees of Ptosis.—The commonest type of ptosis is not associated with paralysis of the levator. It is *partial* ptosis, and although the eyes or eye (it is not seldom unilateral) under ordinary conditions do not open wide enough to expose much over half of the cornea, yet when an effort is made to open them, the lids are easily raised farther, and often the whole cornea may be exposed.

The causes of this common partial ptosis are: (1) swelling of the lids; (2) too short a palpebral fissure; (3) inaction of the *musculus tarsalis* of Müller. Trachoma is a common etiologic factor.

There are a great many cases of moderate or slight ptosis where the patient is painfully conscious of the disfigurement; but ophthalmologists rarely advise operation. These patients are very grateful for the marked improvement in their appearance which can be made by suitable operation.

Congenital and acquired paralysis or paresis of the levator is the next most common type. Pseudoptosis, due to spasm of the orbicularis, is another type.

The differential diagnosis is important in deciding on the treatment. If there is *swelling of the lids*, it needs appropriate treatment, according to the nature of the case. Inspection and measurement will show whether the *palpebral fissure is too short*, blepharophimosis. If it is, canthoplasty may be needed to correct it and aid any other treatment that is given. If the *musculus tarsalis* is inactive, cocain dropped into the eye will often cause the eye to open to a normal extent; and this is a very useful procedure to demonstrate to the patient the way the eye should look, and can be made to look by suitable operation.

We cannot tell whether the levator is partly paralyzed by simply asking the patient to open his eyes. He may be able to

open them to some extent by the aid of the frontalis muscle. This can be excluded by pressing the finger so firmly against the patient's brow as to prevent the frontalis from moving it. Now tell the patient to open his eyes, and if the lids are moved, it is evidence of the activity of the levator. Another clue is afforded by the wrinkle or sulcus of the upper lid; this grows deeper if the levator is pulling the eye open; it grows less if the frontalis is pulling it open, and well-marked tranverse wrinkles appear in the forehead. (Fig. 17, p. 255.)

There are three classes of operations for Ptosis:

I. When the levator is available.

II. When the levator is not available, but the superior rectus is.

III. When neither the levator nor the superior rectus is available, and the frontalis must be relied on solely or chiefly.

I. When the levator is present and active, but needs to be made to act more strongly, we can secure exceedingly satisfactory results by vertical shortening of the lid or advancing the levator tendon.

II. When the levator is entirely out of the question, and a substitute must be used, we can get good results in a fair percentage of cases by utilizing the superior rectus after Motais.

III. Satisfactory results are less common when the frontalis is made use of.

Contraindication.—In no case should operation be used until it is clear that recovery will not take place under medical or expectant treatment. Ptosis is often due to syphilis, and in these cases is often cured by suitable treatment.

Ptosis due to acquired paralysis of the levator is often associated with paralysis of the ocular muscles. If so, and the vision is normal, there is almost sure to be diplopia when the lid is raised. Under these conditions, to cure the ptosis by operation might cause a very disastrous result, since it might cause a diplopia with all its consequences.

I wish to call attention to a few points concerning the anatomy and the physiology of the lids which seem important from an operative point of view.

Tarso-orbital fascia.—The connective tissue network of the orbit and lids is usually described as made up of fairly distinct and well defined layers or bands; but in reality the connective tissue pervades the whole area, ramifying between the muscles and even the muscle fibres, and between the fat lobules, etc. The

nerves and vessels pass through, and are supported by it; and the relations of the various structures are maintained by it. Here and there it has more work to do in maintaining the relations of the structures, and at these points it is more developed and so more conspicuous and easily made out by dissection. These places are functionally and hence anatomically important, and so special names have been given to these specially developed layers and bands. The capsule of Tenon, the check ligaments, the internal and external palpebral ligaments of the lids, and the septum orbitale or tarso-orbital fascia, are the most important of these. The connective tissue fibres blend with the periosteum whenever they are contiguous to it. Thus the periosteum may be said to send out fibres. The fibres which go to make up the septum orbitale do not go straight from the periosteum of the orbital margin to the tarsus, but curve forward, forming a loop when seen in vertical cross-section. When the eye is closed this fascia extends farther forward. When the eye is opened, it is drawn back, because the lower part of the "loop" is formed by the levator tendon which retracts it when it raises the lid. The appearance of the lids is much influenced by the form of this fascia. When the loop is large and extends rather far forward, the lids are more puffy or baggy looking, especially the lower lids—sometimes mistaken for an edema. In the upper lids the part near the nose shows the bagginess more frequently than the middle or temporal part. From the cosmetic point of view the form and appearance of the lids are exceedingly important.

The skin of the lids has virtually no fatty layer under it. The subcutaneous fat ceases at the margin of the orbit where the tarso-orbital fascia curves forward; and numerous septa spring from the anterior surface of this fascia to form the supporting connective tissue network of the fat, and of the orbicularis muscle. (See Fig. 1.) These offshoots make it difficult to dissect a clean cut anterior surface to the tarso-orbital fascia; the posterior surface is smooth and well defined. The nearer you keep to the orbital margin the more definite is the septum orbitale. The nearer you get to the tarsus the more indefinite and hard to make out.

The *Levator* muscle (Fig. 1) divides into two layers, upper and lower.

The separation takes place at a point over the tendon of the superior rectus, and therefore farther forward than the point where the superior rectus sends a slip to the levator.

The lower half of the levator muscle is inserted by a very

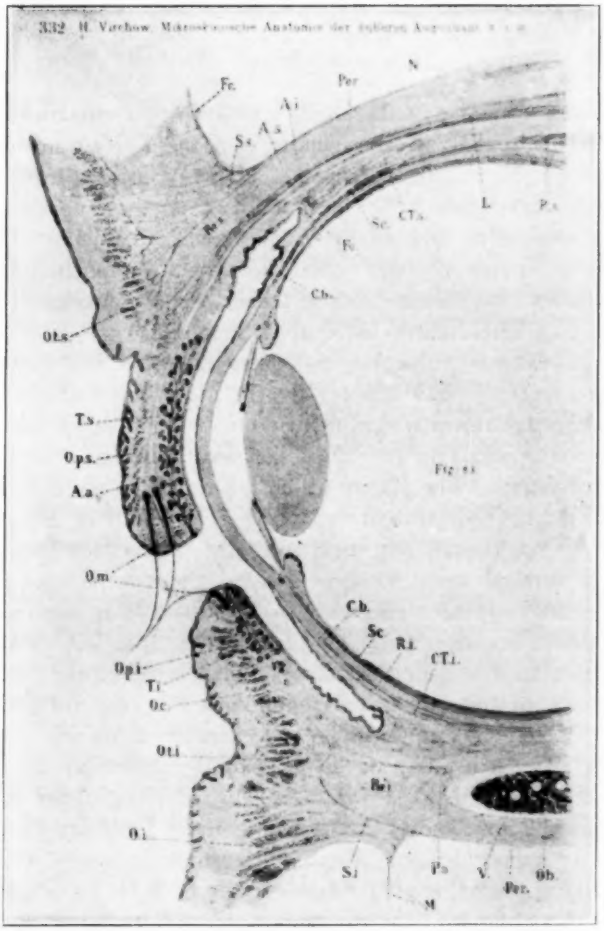

Fig. 1

Levator muscle dividing into two layers, about opposite the insertion of the superior rectus—*R. S.*

Ai, As. Inferior and superior portions of the levator tendon. Between *Ai* and the tarsus is the smooth muscle of Müller, *musculus tarsalis*, which acts as one of the insertions of the levator.

As, the superior portion of the levator, is inserted into the middle connective tissue stratum of the lid, with ramifications between the orbicularis fibres into the skin. It is also inserted into the tarso-orbital fascia (below Re.S.) which it pulls back into the orbit when the lid is raised.

The levator also is connected with the capsule of Tenon, *CTs*, and so with the fornix conjunctivae, *Fo*, which it retracts when the lid is raised.

Fr. Frontal bone.

Per. Periosteum, continuous with *Ss*, the septum orbitale or tarso-orbital fascia, from which numerous connective tissue septa extend between the lobules of fat and between the bundles of orbicularis fibres. This fascia is best defined near the orbital margin at *Ss*. When it is penetrated in dissecting at this point, the fat which is encountered is different from the fat in front of the septum; it is not held in place by many fascial fibres, but is very mobile and tends to keep working out into the wound. In the illustration the space allotted from frontal bone to levator tendon vertically below the orbital margin is too small compared to the space from the levator tendon to the sclera, for of course there is no such conjunctival space as is represented, the palpebral conjunctiva being in contact with the bulbar conjunctiva.

short tendinous portion into the *musculus tarsalis*, or smooth fibred muscle of Müller. This takes place on the level of the fornix of the conjunctival sac. This smooth muscle acts as the continuation of the tendon of the levator and is inserted into the upper margin of the tarsus on its anterior and posterior surfaces.

The upper half of the levator does not become tendinous as soon as the lower, and the transition from muscle to tendon takes place by degrees, connective tissue fibres gradually increasing in number, and muscular fibres gradually diminishing in number, as the muscle spreads out fan-shaped into its tendinous expansion. This is *not* inserted into the tarsus, as the lower half of the muscle is, but into the middle connective tissue layer of the lid, which lies between the tarsus and the orbicularis, and sends numerous extensions between the bundles of the orbicularis obliquely forward and downward to the skin. Thus the insertion of the levator is distributed very extensively to many parts of the lid.

The principal blood vessels of the lid lie in this middle connective tissue layer, near the upper and lower margins of the tarsus.

The nerves also lie in this layer, sending terminal fibres through the orbicularis to the skin, and through the tarsus to the conjunctiva. The source and distribution of the sensory nerves of the lids are important for local anesthesia. The upper lid has four sensory nerves—the lacrimal, supraorbital, supra- and infratrochlear. The lower lid is supplied by the infraorbital.

PHYSIOLOGY OF THE LIDS

The levator opens the eye; it also retracts the conjunctiva in doing so. When the eye looks up, the levator automatically pulls the lid up farther. Thus the superior rectus and the levator are constantly acting together. Almost the only time they do not act together is when the eye is closed, as in sleep. Under these conditions, the levator relaxes, allowing the lid to close; but the superior rectus contracts, with the inferior oblique, rolling the eye up under the lid. These peculiarities are important in treating ptosis, since advantage can be taken of the synergistic action in Motais' operation, and advantage can be taken of the action of the superior rectus and inferior oblique in rolling the cornea up under the lid in the case of any ptosis operation which so shortens the upper lid or levator as to make complete closure of the lids difficult. Were it not for this, the cornea might be exposed in sleep, and ulceration would surely follow.

The *musculus tarsalis,* or smooth muscle of Müller, regulates to a considerable degree the width of the palpebral fissure; that is, it determines how wide the eye shall open. Thus if a few drops of cocain are instilled into one eye, it will presently be found that that eye is more widely opened than the other. Anything else which stimulates the sympathetic, and so causes this muscle to contract, will cause the eye to open wider, for example, fear, hyperthyroidism, etc. Paralysis of this muscle causes partial ptosis.

The orbicularis closes the eyelids; it also holds the lids in contact with the eye. Closing the lids requires very little force, so it is not surprising that excision of a considerable part of the palpebral portion of the orbicularis does not result in defective closure.

ANESTHESIA

Local anesthesia for ptosis operations is very satisfactory. Cocain, 4 per cent., with a little adrenalin should be instilled in the conjunctival sac. Procain, 1½ per cent., with adrenalin 1:10000 should be injected in order to block, more or less, the nerves supplying the upper lid, and also in order to act on the nerves in the field of operation. Procain with insufficient adrenalin is very unsatisfactory. Inject about ½ c.c. deeply at the supra-orbital notch; ½ to 1 cc. between that point and the inner canthus, also deeply—that is, not just under the skin, but into the space just over the periosteum where the nerve trunks lie. This will block the supra- and infratrochlear branches which supply the inner part of the uper lid: ½ to 1 cc. just above the external lateral ligament; this will block the lacrimal nerves which supply the outer part of the upper lid: ½ cc. subcutaneously into the upper lid, to take care of any terminal fibres which were not intercepted by the blocking injections. In case of operations in which the field of operation extends through the tarso-orbital fascia into the anterior superior part of the orbit, ½ to 1 cc. should be injected into this space, the needle being thrust through the tarso-orbital fascia just below the upper margin of the orbit. The anesthesia is not at its maximum for a few minutes, and it is a mistake to begin too soon after injecting, thus causing some pain and losing the patient's confidence.

PREPARATION OF THE SKIN

Shaving of the brow and cutting the lashes is not necessary, and is objectionable in a cosmetic operation. The skin should be well washed with soap and water a few hours before the operation. At the time of the operation do not use water, but scrub

the skin, especially the hairs, with benzine. Follow with tincture of iodin, 3½ per cent., applying it freely to the eyebrow, less freely to the skin.

FIRST OPERATION

Vertical shortening of the lid by excision of a piece of tarsus. The various operations of Bowman, Graefe, de Grandmont, Nicati, and Gruening represent the English, German, French, Italian, and American modifications, and several others have been proposed. The following seems to me the best way to do this very satisfactory operation:

Evert the lid, and hold it with the fingers of the left hand,

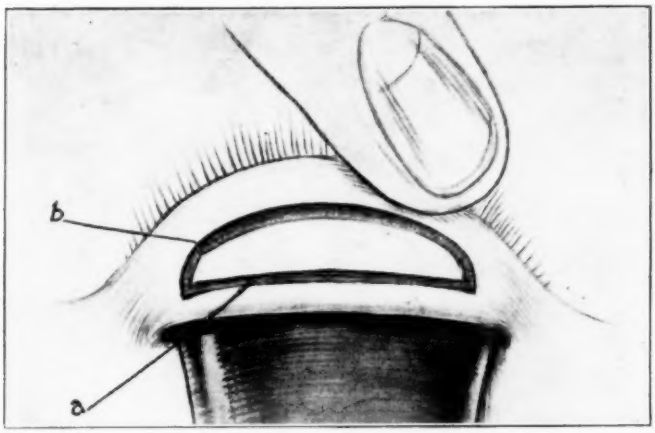

Fig. 2
a. First incision.
b. Second incision.

Lid held everted by the forefinger of the left hand, exposing the conjunctival surface of the tarsus.

Note.—The piece to be excised should not taper off gradually at the ends, but preserve a good width well out to each end.

There is a tendency for the first incision to be farther from the true upper margin of the tarsus at each end than in the middle, because of imperfect eversion of the lid whereby the two ends are not rolled over as completely as the middle.

or use the lid clamp of Miss Ehrhart of the N. Y. E. E. Inf. Make an incision, with a sharp scalpel, parallel to and 1 mm. from the upper margin of the tarsus[1]. (See Fig 2.) It is not usually best to try to cut boldly through the tarsus at the first stroke; but make a shallow cut, to mark the location of the incision, and then deepen it gradually along the whole length of the lid. When the tarsus has been cut through at some point, the

[1]When I say "upper" margin of tarsus I mean the true upper margin though with the lid everted it lies lower than the palpebral margin.

incision can be completed with small scissors, such as Stevens'. It is possible to make the whole incision with the scissors, simply making an initial cut with the knife large enough to admit the point of the scissors. This method never gives as straight and neat an incision; it is sure to be jagged and uneven unless the line is first marked by the knife, cutting a groove deep enough for the scissors to follow. Next, make a second incision through the conjunctiva into the tarsus, marking out the oval piece it is intended to excise. (See Fig. 2.) It is best to decide just how wide a piece to excise, and mark it out with the knife, rather than to cut out a smaller piece and then increase the opening by paring off some more with the scissors. The edge of the wound

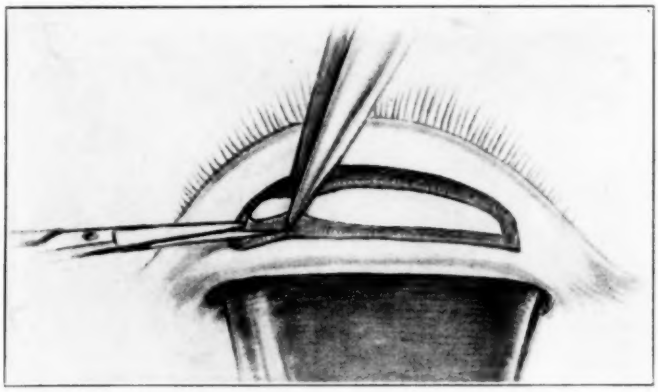

Fig. 3
Excising tarsus with overlying conjunctiva and underlying orbicularis

is never as smooth and even when it is made in that way. The width of this piece should be slightly greater than the amount by which it is desired to increase the width of the palpebral fissure, because you will not gain quite as much as the width of the piece you excise. There is no danger of getting too much effect, except when operating to correct a one-sided defect; in this case, it is best to make the two eyes match as closely as you can. When operating on both eyes, the danger of getting too great an effect is small, because the width of the tarsus which is available for excision is hardly more than five millimeters, since it is essential to leave at least 2½ millimeters of the free margin containing the tarsus, to form the lid border and give the lid shape, and prevent loss of lashes. Excise the piece outlined, using scissors, and remove some of the orbicularis at the same time. (Fig. 3.)

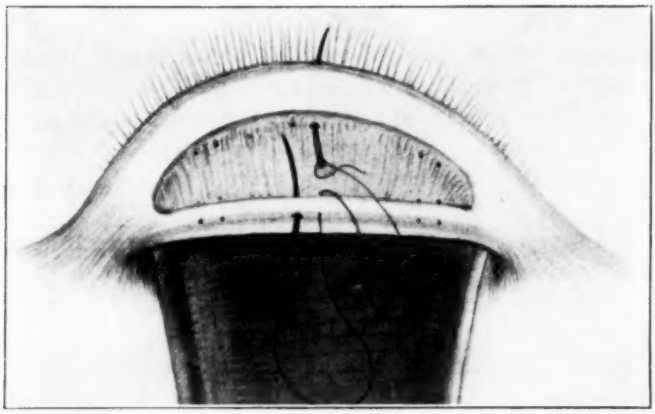

Fig. 4
Method of inserting sutures in excision of tarsus from the conjunctival side of the lid

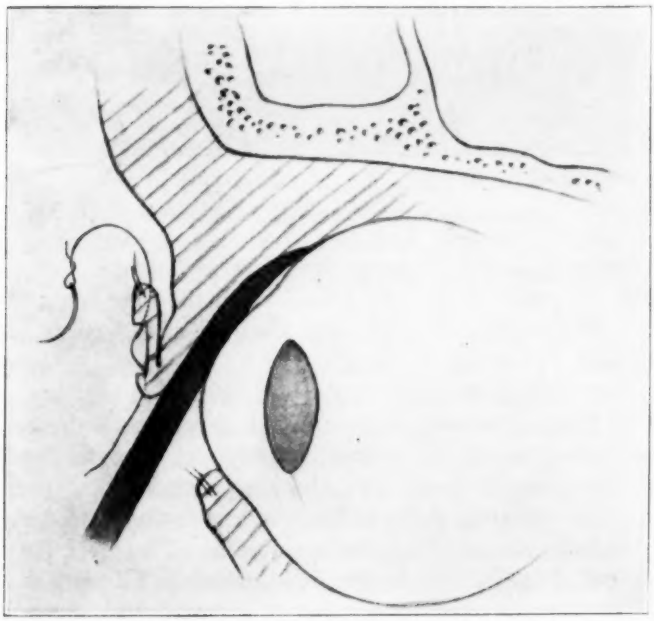

Fig. 5
Method of inserting sutures

Next, insert three sutures. These should be double armed. The needles are passed from above downward. Starting on the conjunctival side of the upper margin of the wound, the needle is passed through the narrow bit of tarsus which is left, or through the tissue just above the tarsus, and the needle brought out through the wound. (See Fig. 4.) The other needle is entered alongside the first, and 1½ to 2 millimeters from it, and brought out in the same way. This leaves a loop of thread on the conjunctival surface of the upper lip of the wound. Each needle is then put through the lower flap, passing along the anterior surface of the tarsus through fibres of the orbicularis muscle, to emerge at the lid margin just in front of the lashes. (See Figs. 4 and 5.) The two needles should come out about two millimeters apart. One such double-armed suture is placed in the middle, and one each side. As fast as each suture is placed, the

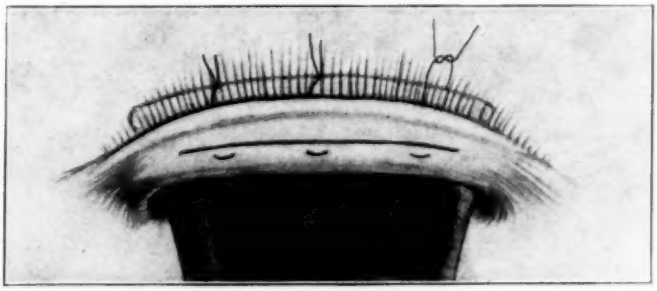

Fig. 6
Sutures tied over coarse silk or silkworm gut

two free ends should be clamped together with light snap forceps, so that the ends will not get mixed when the time comes to tie them. The sutures are tied over a strand of silkworm gut or coarse silk. (See Fig. 6.)

This method of inserting the sutures avoids the dangerous knot on the conjunctival surface, which may scratch the cornea. It holds the lips of the wound securely together and tends to evert the edges, thus bringing the raw surfaces in opposition, rather than inverting them, which is a very faulty way of closing a wound of skin or of mucous membrane. Tied over the silkworm gut, there is little danger of injuring the lid margin.

The sutures should be retained three to five days. For twenty-four hours both eyes should be kept bandaged, to prevent movement of the lids. After the second day the unoperated eye can be left uncovered. If both eyes are operated at the same

time, both should be kept covered for four or five days. The dressing should be changed daily, and the eyes well washed out.

PRECAUTIONS

There is a tendency to excise a piece of such shape as to leave the contour of the lid margin faulty by being too much elevated in the center as compared with the two extremities; the arch of the upper lid margin when the eye is open is then too much of a Gothic, almost pointed arch. To avoid this, make the piece to be excised of good width all the way across the lids from end to end, not tapering much until nearly at the end.

There is danger of sloughing of the skin under the silkworm gut or rubber over which the sutures are tied, if there is much pressure; and if this occurs, the scar will make a deformity—slight, to be sure, but one to be avoided by watching the condition and removing the stitch at the first sign of anything wrong. There is a tendency for stitches here to suppurate if left too long, so that it is often well to remove them before the fifth day. The two lateral stitches may be removed a day or two earlier than the central one.

Care should be taken that the stitches are not so placed as to injure any of the lashes, which may easily happen if the needle is passed through the roots of any of them.

SECOND OPERATION ADVANCING THE LEVATOR

When a greater effect is desired than can be secured by excising a piece of the tarsus, it is necessary to advance or tuck the levator, provided, of course, the levator is not completely paralysed. Eversbusch, de Lapersonne, Elschnig, Meller and others, have described ways of doing this. The following method is based on these.

The difficulty in advancing the levator is in securing and isolating the levator tendon. The levator is not inserted in a manner in any way comparable to the rectus muscles. The anatomic end of the tendon of any of the recti muscles is perfectly unmistakable; it comes abruptly to a full stop in the sclera. The levator has a very complicated insertion, correctly described in very few books. (See Fig. 1.)

The problem of advancing the levator is made much less difficult if one secures a definite and reliable hold of the insertion and so is able to pull the muscle forward and get the sutures through the whole tendon. This may be accomplished in the following way:

First incision, the length of the lid, through the skin and

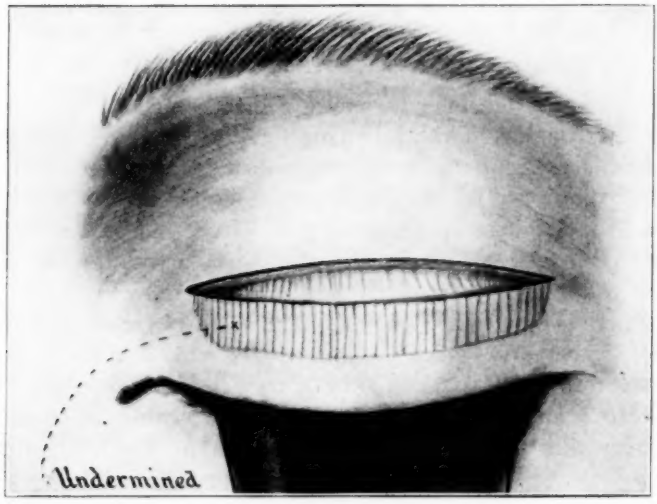

Fig. 7

Operation for advancing the levator. First skin incision exposing the anterior surface of the tarsus

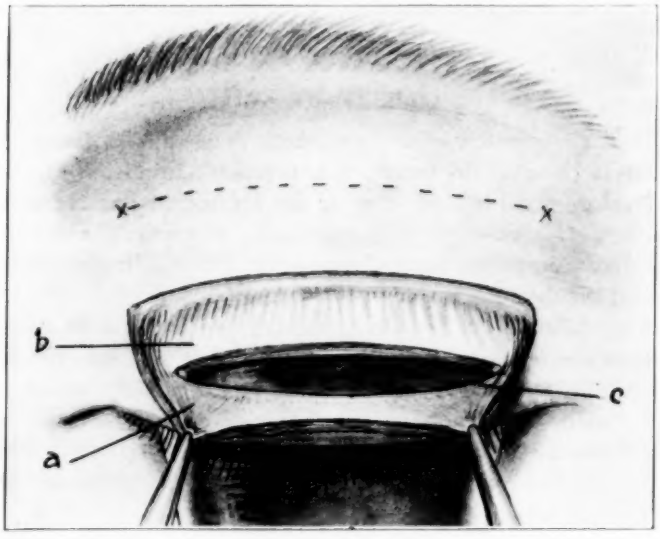

Fig. 8

a. Skin and orbicularis retracted, exposing
b. The tarsus.
c. Second incision, which perforates the lid about 4 mm. from the lid margin. Jaeger plate is seen exposed through this incision.
x.x. Location of third incision, halfway from first incision to orbital margin.

orbicularis, just below the upper border of the tarsus and parallel to it. (See Fig. 7.) Undermine the lower flap, exposing the tarsus, but do not undermine the upper flap, because the levator is inserted into it. The lid is supported and the cornea protected during this incision and the next, by the hard rubber lid plate of Jaeger.

Second incision is in the exposed tarsus about 4 mm. from the lid margin, through tarsus and conjunctiva down to the lid

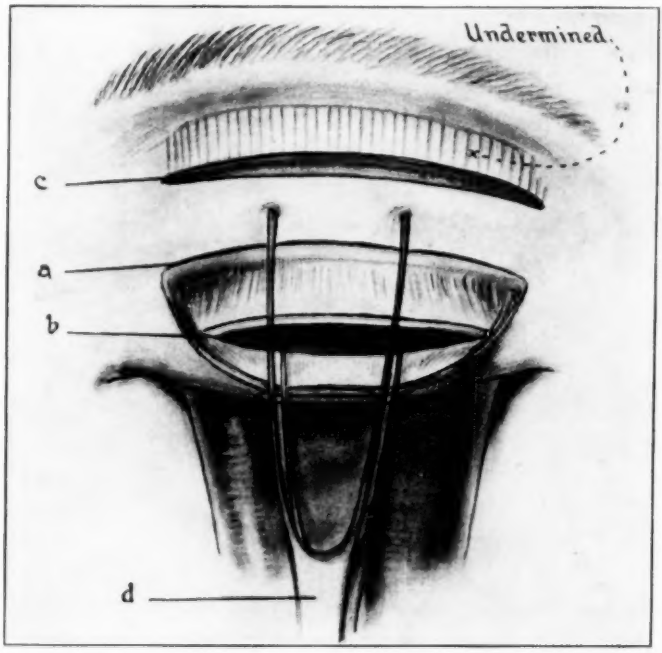

Fig. 9

a. First incision, through skin and orbicularis.
b. Second incision, through tarsus and conjunctiva, buttonholing the lid.
c. Third incision, through skin and orbicularis halfway between a and orbital margin. This is dissected up, exposing the tarso-orbital fascia.
d. Double fixation forceps grasping the whole thickness of the lid.

plate, thus making a large buttonhole in the lid. (See Fig. 8.)

Third incision, through skin and orbicularis, but carefully avoiding the tendon of the levator which lies underneath. The incision is horizontal, about 4 mm. above the 1st incision. (See Figs. 8, 9.) It is above the sulcus or wrinkle made by the levator when the eye is opened.

Between incisions 2 and 3 lies the major part of the insertion

of the levator; the lower half of the tendon inserted into the border of the tarsus, and the upper part, comprising the fan-shaped radiations, inserted into the orbicularis and skin between the two skin incisions.

The skin between the first and second incisions, together with the underlying tarsus is grasped in fixation forceps, one blade on the skin, one (through the second incision) on the palpebral conjunctiva. (Fig. 9.) Double or bident fixation forceps are good for this purpose, since they hold the lid out flat. Prince's advancement forceps can be used. Another very good way is to pass a stitch through this tissue to hold it by. This thick flap is

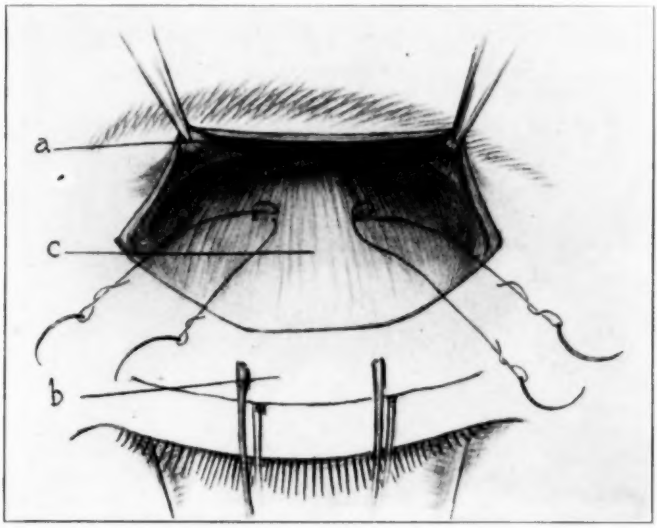

Fig. 10

a. Flap of skin, orbicularis, and tarso-orbital fascia retracted upward.
b. Flap containing insertions of levator being pulled downward, putting on stretch levator tendon, c.
Two whip stitches passed through tendon of levator. Each should include a larger piece than shown in the cut.

then pulled down, thus putting on the stretch the levator tendon. It also causes the upper incision (c) to gape. This should now be dissected deeper by retracting the upper flap of skin and orbicularis, and penetrating the tarso-orbital fascia about 4 mm. below the orbital bony margin. The nearer the orbital margin the better defined the septum is likely to be found. The anterior surface of the tarso-orbital fascia or septum orbitale gives off numerous septa or layers which extend forward between the bundles of orbicularis fibres and subcutaneous fat, so that it

does not show distinctly except when dissected from behind. Do not waste time trying to identify it, but make horizontal dissecting cuts deepening the wound at a point about 4 mm. below the upper margin of the orbit. Orbital fat will be encountered, and beneath it the tendon of the levator, easily identified by pulling it with the forceps or stitch attached to its insertion.

Next, insert two sutures into the tendon of the levator, dividing the space between them. They will be about 6 mm. apart. (Fig. 10, 11.) These are whip stitches, made by passing the needle twice around the bunch of fibres included in the stitch.

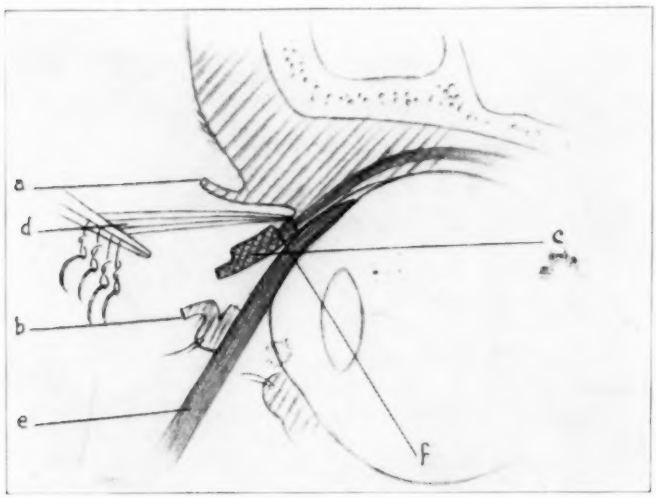

Fig. 11

a. Upper skin flap retracted.
b. Lower skin flap retracted.
c. Mass (held by forceps) consisting of skin, tarsus, conjunctiva and all the insertions of the levator.
d. Two double-armed whip stitches passed through the levator tendon.
e. Jaeger lid plate.
f. Point where tarsus and skin are excised, leaving tendon held by sutures.

In placing these sutures, one should bear in mind that the point where they are inserted is to be attached to the tarsus near the margin of the lid. They should not be too far back, or lagopthalmos will be extreme.

We now have a secure hold of the levator and can fold it down in a tuck or cut away the skin and tarsus into which it is inserted, making an incision a few millimeters below the sutures in the tendon. (Fig. 11.) The tendon should now be separated by a slight dissection from the underlying conjunctiva for 2 or 3 mm. (Fig. 12.)

Next pass the needles between tarsus and skin, coming out through the border of the lid just in front of the lashes. (Fig. 13.) The end of the tendon can then be drawn down into the pocket between tarsus and skin.

Lastly, a security stitch is inserted by passing two needles of a double armed suture from the conjunctival side *through the thickness of the lid.* The needles are 2 mm. apart, and include the conjunctiva and tarsus of the lower flap, the tendon of the levator midway between the two sutures placed in it, and the skin of the lower flap. (See Fig. 12B.) A few stitches may be needed to secure perfect apposition of the skin of the lid.

This operation has a limited field of usefulness, and I have not found occasion to use it personally because in the great ma-

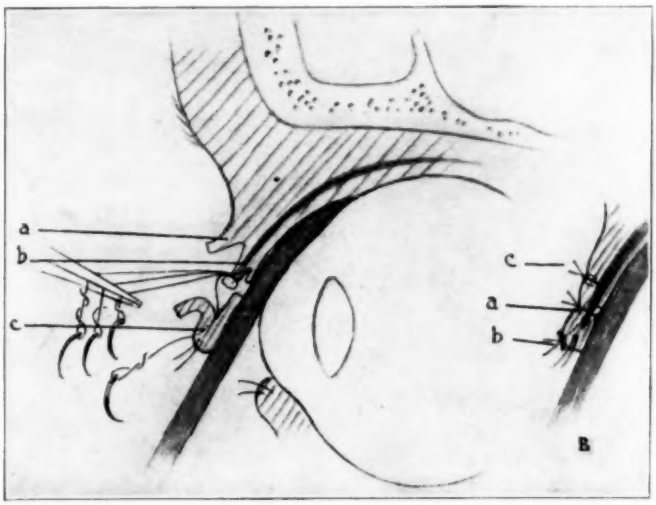

Fig. 12 and Fig. 12B

a. Skin, orbicularis, and tarso-orbital fascia.
b. Tendon of levator dissected free from underlying conjunctiva.
c. Manner of passing stitches through lower flap, emerging in front of lashes to be tied over rubber washers.
B shows security stitch a through entire thickness of the lid.
a. Security stitch, double armed, both needles passed from conjunctiva through tarsus, tendon of levator and skin of lower flap, thus clamping levator tendon between tarsus and skin.
b. Primary stitch from levator tendon tied over rubber washer in front of lashes.
c. Stitch closing skin incision.

jority of cases where the levator is capable of contracting enough to be of use, it will suffice to shorten the lid by excising the tarsus (operation No. 1). One of the chief precautions is not to try to get too great an effect, thus producing lagophthalmos.

MOTAIS OPERATION

The third operation is for those cases where the levator is useless, but the superior rectus is available. Motais, Shoemaker, Wilder, Parinaud and others have described ways of doing this. It gives good results in favorable cases. It is not so easy to perform as the other ptosis operations.

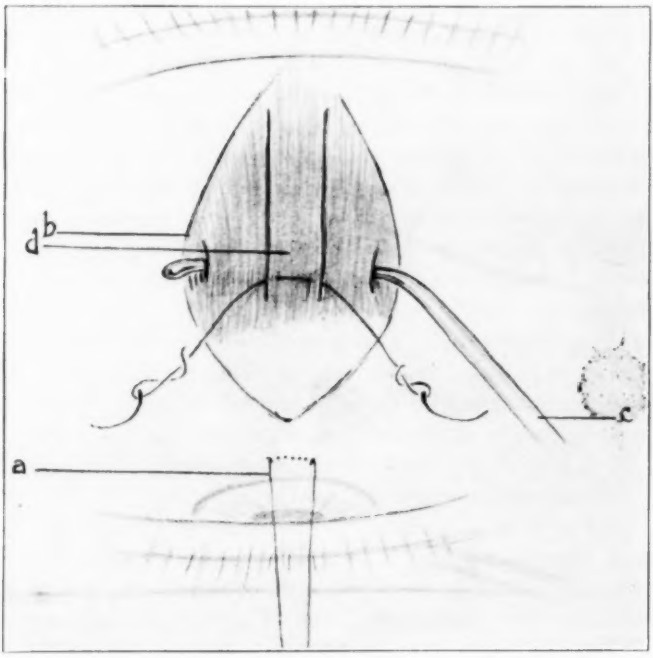

Fig. 13

MOTAIS OPERATION

a. Fixation suture to pull the eye downward.
b. Vertical incision in conjunctiva along the middle of the superior rectus muscle from cornea to fornix.
c. Muscle hook under tendon of superior rectus.
d. Central strip of tendon and muscle isolated by two vertical incisions parallel to the fibres.
Double-armed suture, both needles passed from above down through the tendon, coming out one through each incision in the tendon.

It does not require a very strong and active superior rectus as might be supposed. Owing to the ptosis the superior rectus has had greatly reduced opportunity to act, and so may appear paretic. After the operation it often responds in a very satisfactory way to the extra demands made upon it. It is aided, of course, by the inferior oblique. There may be temporary di-

plopia, due to the superior rectus not pulling the eye up as it should. This usually recovers.

It is easier to do the operation in the following way, rather than strictly according to Motais.

Local anesthetic is satisfactory. Insert speculum. Expose the superior rectus through a vertical incision along the middle of the superior rectus. Separate the conjunctiva over the muscle as far back as the fornix. Raise the tendon on the muscle hook (Fig. 13), but do not isolate it by incisions along its borders any more than is required to pass the hook under it. Make two longitudinal incisions through tendon and muscle about 10 mm. long and 4 mm. apart, isolating a strip in the middle of the tendon and muscle. Do not cut it across at the insertion yet. It is easy to make the longitudinal incisions with small, straight, sharp-pointed scissors. The tendon is held up by the hook, and one point of the scissors thrust through the tendon at the point where the incision should begin—namely, about 2 mm. to one side of the middle line of the tendon.

Great care should be used now, in making the incision, not to cut across any fibres transversely or obliquely, but to cut longitudinally, parallel to the fibres. A small Stevens' muscle hook can now be passed under this isolated central band of tendon and muscle; but it is important to handle it gently, since it is only one-third of the whole muscle and therefore more easily injured.

Next pass a double armed suture through the tendon of this isolated central strip near its insertion into the sclera. Pass both needles from above down through the tendon about 2 mm. apart and 2 mm. from the insertion, the needles coming out on the under surface. This will act as a sufficiently secure hold on this strip of tendon, which can now be cut off close to the sclera, leaving the outer and inner thirds of the superior rectus tendon untouched.

Third step. Remove the speculum and insert the lid plate. Make a horizontal incision through the skin and muscle just above the upper border of the tarsus. This should be about 15 mm. long. Undermine the lower flap, separating skin and muscle from the tarsus, down to a point 3 mm. above the lid margin. (Fig. 7.)

Next cut through the tissues above the upper border of the tarsus, dissecting backward to reach the fornix of the conjunctiva and thus opening into the conjunctival incision made at the beginning and undermined in order to facilitate the making of this button hole.

Remove the lid plate; pass a pair of forceps through the button hole and grasp the needles, one at a time, and draw them out through the hole in the lid, taking care not to get the threads crossed. (Fig. 14.) Next grasp the end of the tongue of the tendon with a pair of broad fixation forceps and draw it through the lid. It is dangerous to pull it through by the suture.

Fourth step. It remains to attach the strip or tongue of ten-

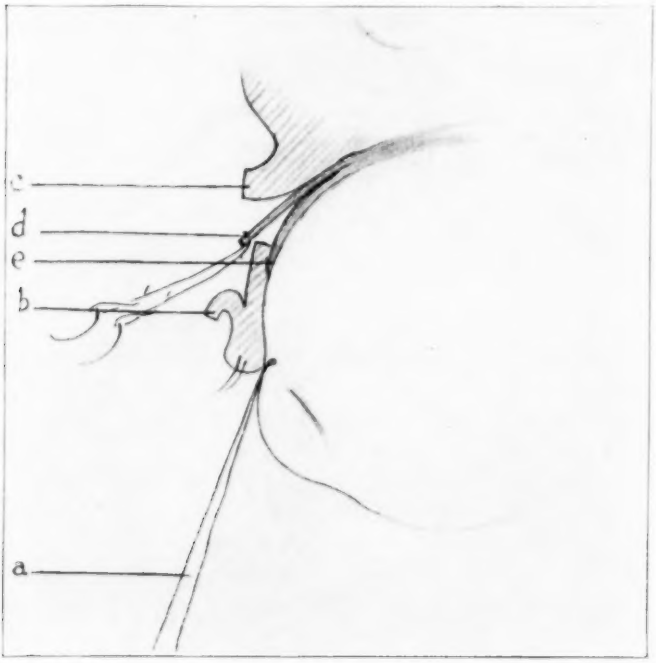

Fig. 14

a. Fixation suture pulling eye downward.
b. Skin and orbicularis retracted, exposing tarsus.
c. Skin and orbicularis and tarso-orbital fascia retracted upward, exposing hole through lid into subconjunctival space of eye-ball over insertion of superior rectus.
d. Tongue of superior rectus drawn through hole in lid ready for attaching to the anterior surface of the tarsus.
e. Remainder of superior rectus attached to eye-ball.

don to the tarsus. If the eye is not well rotated downward by the patient, it is a good precaution to pass a temporary fixation suture through the episcleral tissue just above the cornea, with which to control the eye. If one tries to pull the eye about with the slender tongue of superior rectus, it is very likely to be torn, and the operation spoiled.

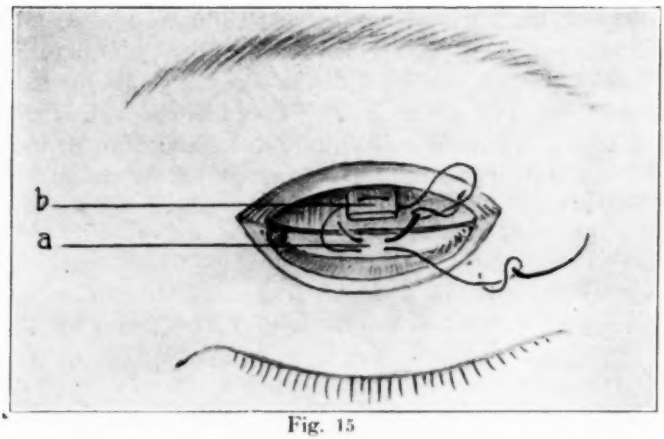

Fig. 15

a. Anterior surface of tarsus ready for attaching tongue of levator.
b. Tongue of levator with double-armed suture; one needle has been passed from left to right, dipping into the tarsus but not perforating it; the other needle is being passed similarly in the opposite direction. When the threads are drawn, the tongue of tendon will be pulled down onto the surface of the tarsus.

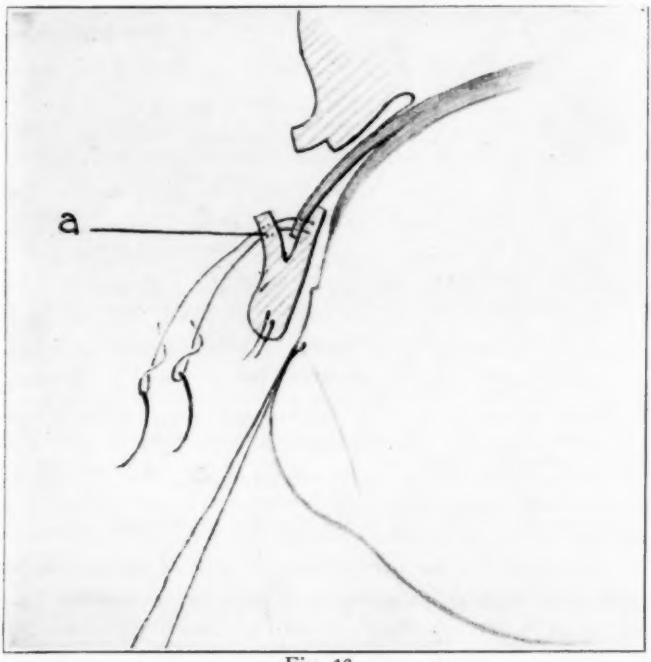

Fig. 16

Both needles are passed through the skin flap, emerging on the anterior surface. When tied over a rubber washer, the tongue of superior rectus is firmly clinched between tarsus and skin.

Pass the right hand needle transversely from right to left through the tarsus, going deep enough to secure a good hold; and pass the other close to it in the opposite way from left to right, both being at the point selected for the attachment of the strip of tendon. (Fig. 15.) This point will be near the upper margin of the tarsus, because the tendon is not long enough to reach far down. The tendon is held in position with the fixation forceps by the surgeon, while an assistant pulls the threads, taking up the slack. When the threads are pulled, the tendon is drawn snugly down on to the surface of the tarsus. The needles are now brought through the skin just over their insertion

Fig. 17

a. Action of frantalis muscles in trying to open the eyes. Note the transverse wrinkles of the forehead; both the wrinkles and the eyebrows arch upward. The sulcus between the eye and the orbital margin is much diminished.

into the tarsus, and tied over a rubber washer. (Fig. 16.) Thus the tongue of tendon is not simply lying loosely in contact with the tissues of the lid, but is firmly bound down on to the tarsus, with the skin pressing firmly upon it in front.

Bandage both eyes for three or four days, then one eye for three or four more. Remove the stitch on the eighth day.

When both the levator and the superior rectus are paralyzed, the only muscle which can be substituted is the frontalis. This nor-

mally is used as an aid to opening the eye by elevating the brow and exerting a slight pull on the skin of the upper lid. This normal action is almost invariably greatly increased in ptosis. (Fig. 17.) It is shown both by the arching transverse wrinkles of the forehead, and by the arching of the eyebrows. Figs. 18 and 19 show how important the configuration of the orbit is in its bear-

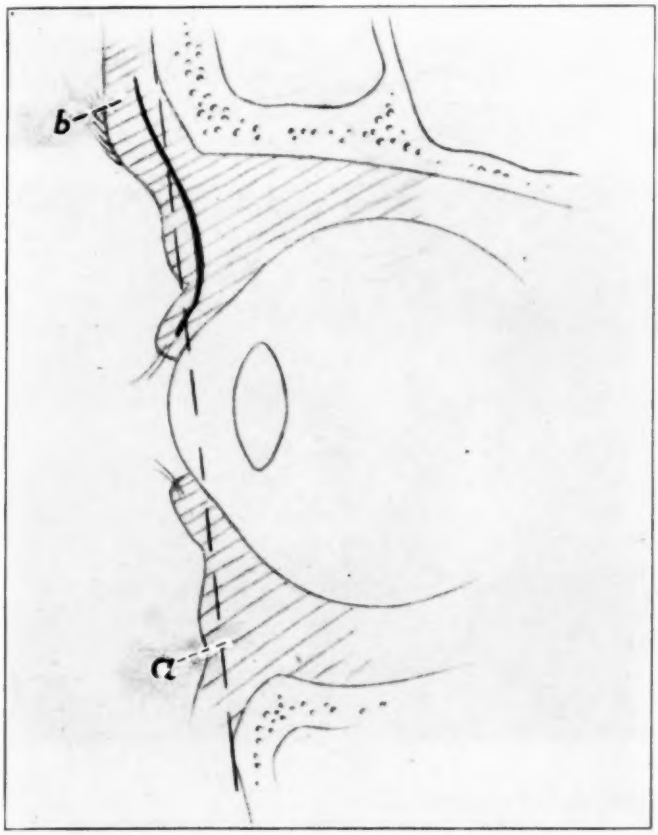

Fig. 18

a. Straight line from upper to lower orbital margin, to show position of cornea. This would be a very prominent eye.
b. Line of pull of frontalis showing that in a prominent eye the frontalis acts in a favorable way in lifting the lid.

ing on the utilization of the frontalis. If the eye is prominent, the conditions are much more favorable for the frontalis to lift the lid than when the eye is deeply set.

I am not prepared to say what is the best method of utilizing the frontalis.

Of the suture operations, the methods of Hess and Worth seem to me the best. Hess does not rely wholly on the sutures, but dissects up the skin of the lid from the eyebrow to the eye lashes.

Worth and Harman get immediate good results, with hardly any convalescent period. In this respect they are very effective.

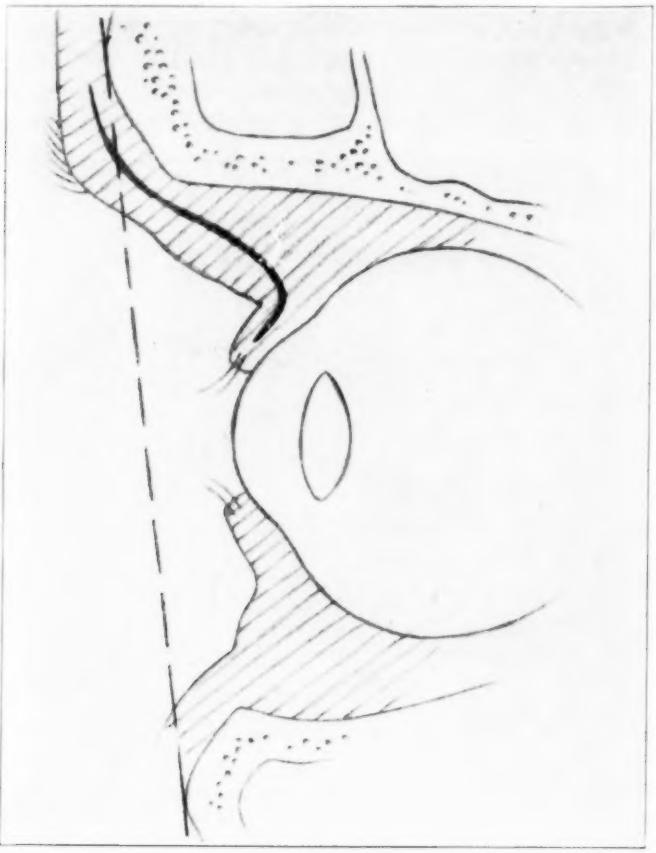

Fig. 19

This shows a more deeply set eye, and a more common configuration of the orbit than Fig. 18. The frontalis does not act in so favorable a way; the upward pull becomes a forward pull. The levator acts by a backward pull. Thus the frontalis is but a poor substitute for the levator.

The end results are not so satisfactory, but no tissue is sacrificed, so that other operations may be done if the more simple suture operation does not prove permanent.

I have had good results with the Panas method; but I have never seen the Angelucci or Fergus methods tried.

Why not combine the Hess and Worth methods? That is, instead of using a Pagenstecher suture, which is allowed to suppurate before removal in the hope that a fibrous strand of connective tissue will be left behind, use a permanent suture of kangaroo tendon aseptically buried. Experience has proved that the fibrous strand of cicatricial tissue, automatically shrinking and so maintaining the necessary traction on the lid, does not follow the Pagenstecher suture.

The Panas operation as modified by *Tansley, Grimsdale, Rollet* and others gives relatively good results. The eye can be opened, and it can be closed sufficiently to protect the cornea.

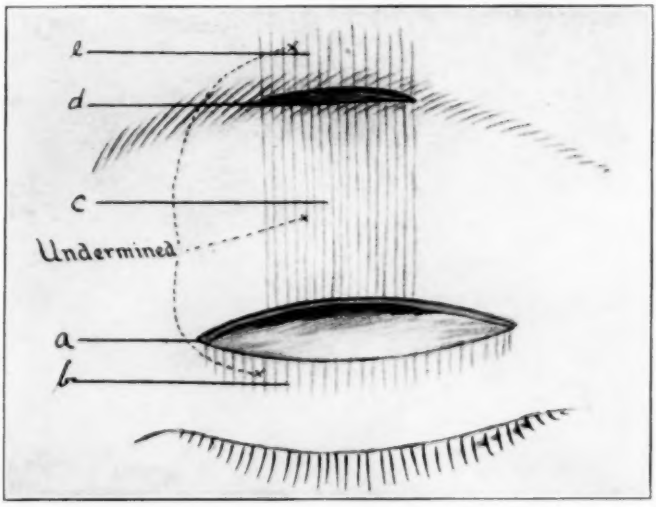

Fig. 20

a. Incision through skin and orbicularis, exposing tarsus.
b. Lower flap undermined to make a pocket for the lower end of the strip of fascia.
c. Tunnel under skin and orbicularis to the upper incision, a.
e. Upper flap undermined, making a pocket for the upper end of the strip of fascia.

It occurred to me four years ago that it might be possible to secure a satisfactory connection between the lid and the frontalis by utilizing a piece of transplanted *fascia lata*, which has proved so valuable in plastic surgery of the tendons of the hand. I tried the operation on the cadaver, and found that it presented no difficulties. I then tried it on the living, but so far have had only one case. The end result in this was reported good. Rather than wait longer, I thought it might be well to present the operation, for criticism and perhaps trial by other surgeons.

To secure the fascia lata, make a longitudinal incision through skin and fat down to the fascia on the outer side of the thigh about halfway between hip and knee. The silvery sheen of the fascia is readily recognized and exposed beneath the subcutaneous fat. Two longitudinal incisions are made in this about 10 mm. apart and 25-30 mm. long. This piece is removed, and the opening in the fascia closed with stout catgut. The skin is closed by suitable sutures. Of course this little operation should be aseptically done and the piece of fascia lata carefully kept aseptic, and not exposed to trauma, drying, etc.

Preparation of the lid for the fascia lata: Make a horizontal

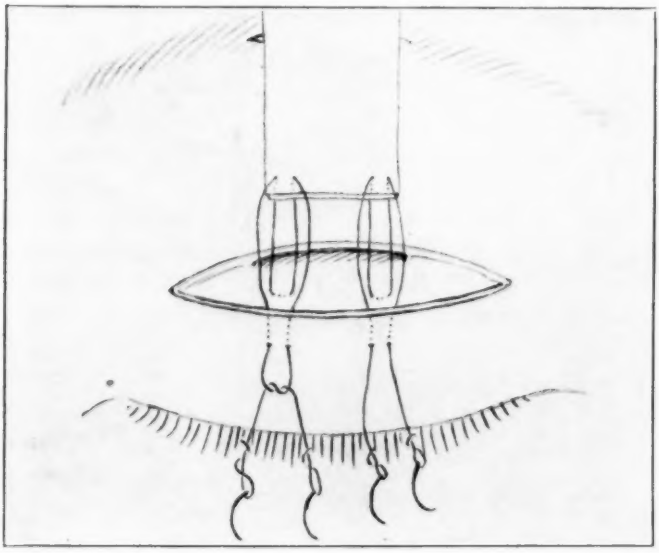

Fig. 21

Method of placing the sutures in the lower end of the strip of fascia. Before the sutures are inserted, the fascia should be drawn into the tunnel where it is to lie, carefully maintaining asepsis.

incision 20 mm. long just below the upper border of the tarsus, and dissect skin and orbicularis from the surface of the tarsus, making a pocket for the lower end of the fascia lata. (Fig. 20.) Make a second incision, parallel to the orbital margin along the eyebrow 20 mm. long. Dissect a tunnel between the two incisions, raising a bridge of skin and orbicularis from the underlying tarso-orbital fascia. Dissect a pocket under the upper lip of the brow incision for the reception of the upper end of the fascia lata.

The method of suturing the fascia lata to the anterior sur-

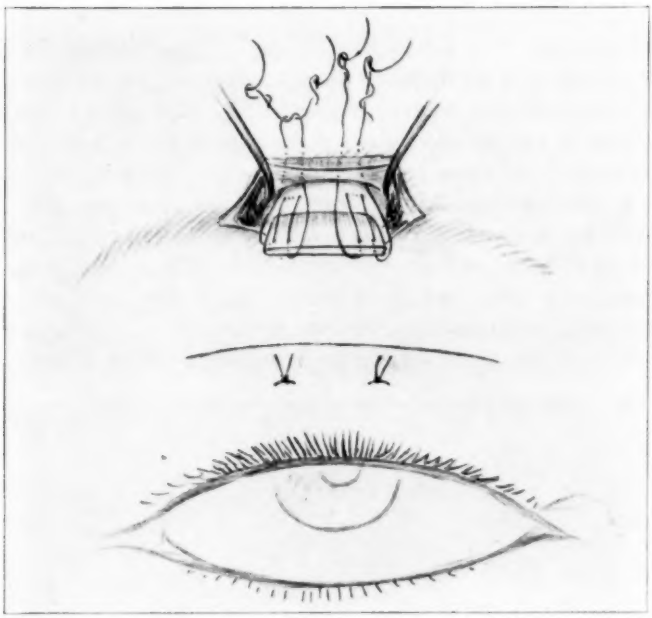

Fig. 22. Lower stitches tied. It is better to tie them over rubber washers. Method of placing the sutures in the upper end of the fascia.

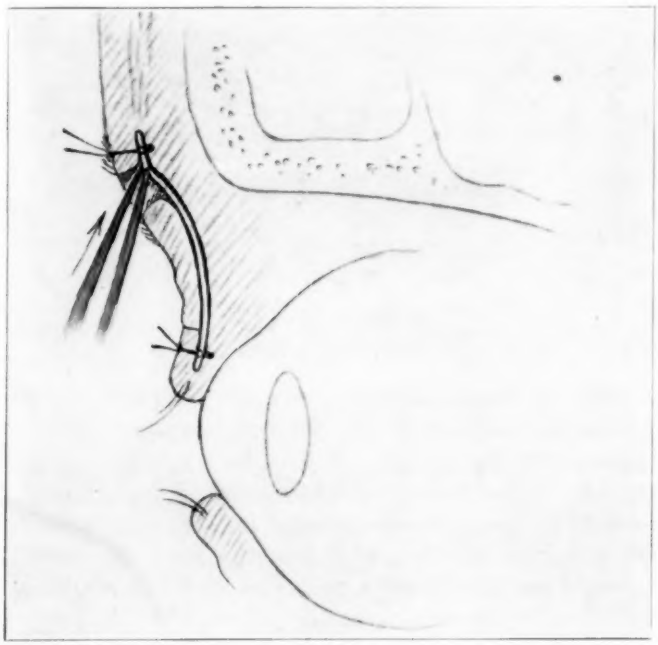

Fig. 23. Method of holding the fascia up in place while the sutures are being tied. Rubber washers are omitted.

face of the tarsus is shown in Figure 21. A double-armed suture is passed horizontally through the substance of the tarsus, not penetrating the conjunctiva. It should be placed about 2 to 3 mm. below the upper edge of the tarsus, and 3 to 4 mm. to one side of the vertical mid line of the lid. Each needle is passed through the fascia lata about 2 to 3 mm. from its lower end. A second suture is placed in the same way, the same distance the other side of the mid line of the lid. The needles are then passed through the skin from the wound, and when tied (over rubber washers) they clamp the piece of fascia firmly between the tarsus and the overlying flap of orbicularis and skin.

The upper end is sutured into the pocket under the upper flap of the wound in the brow in a similar way (Fig. 22). First, pass one of the needles through the deep surface of the pocket where the fascia is to be attached; next, pass both needles through the fascia a few millimeters apart; lastly, pass the needles out through the skin exactly over the spot where the stitch was first placed in the deep layer. When ready to tie, hold the fascia up in place with forceps until firmly tied. (Fig. 23.) Place two sutures in the upper end, just as two were placed in the lower end.

Of course the amount of effect depends on the length of the piece of fascia. To determine this, the piece of fascia, after it has been attached to the tarsus and lies in position in the tunnel, should be grasped with one or two pairs of forceps and pulled up through the opening in the brow, raising the lid. After several tentative pulls in this way, one can decide what point of the fascia he wishes to attach to the brow.

If the sutures are passed simply through the fascia and then out through the skin without first getting a bite of the deep layer of the pocket, when they are tied the fascia is not clamped firmly between the upper and nether layers of the pocket, but is simply held against the under (posterior) surface of the skin. Bad results may follow in two ways. First, the stitches may tear out of the fascia; and second, the fascia may not adhere firmly to the skin. It is one of the advantages and also one of the disadvantages of fascia lata that it does not readily adhere to the adjoining tissues. This favors motion, provided the two ends are made secure; hence, the importance of firmly clamping the ends of the fascia between the two layers of the tissue in which we wish to imbed it.

The initial effect with the frontalis relaxed should raise the lid so that the eye is slightly open, but not so that the cornea is

exposed when the eye rotates up as in sleep. The degree of control of the lid will depend on the patient's control of his frontalis. It is well to have him practice this before the operation, if he has not, as is usually the case, been automatically practicing it. His success in doing this will be a guide to the prognosis.

Both eyes should be kept bandaged for at least eight days. It may be necessary to use a layer of protective, well coated with vaseline, next the eye, rather than gauze or cloth which might come in contact with the cornea and cause abrasion and ulceration.

If the sutures are left in too long, they will suppurate, and may cause suppuration to spread along the fascia. Hence it would seem wise to remove them after a week if not sooner, but still keep the eyes bandaged, so that the patient will not move the lids for two or three days after the stitches are out. It seems probable that a temporary stitch from lid to brow after the manner of Pagenstecher might be placed on each side of the strip of fascia lata to support the lid while the fascia is healing in, because healing takes place much better when there is no tension. A double armed suture is passed through a rubber washer below, near the lid margin, and both needles are carried under the skin to a point well above the brow where they emerge and are tied over a rubber washer.

DISCUSSION

JOHN M. WHEELER: There are so many operations for ptosis and the eye surgeon operates for ptosis so rarely that he cannot possibly have a large experience with several methods. So we are indebted to Dr. Lancaster for selecting a few ptosis operations and attempting to place values on them. I agree with Dr. Lancaster in regard to the value of tarsal resection. For drooping of not more than 3 or 4 mm. this operation is satisfactory, and stands out on that account, because most ptosis operations are not entirely satisfactory. Let me suggest the use of the Ehrhardt lid forceps for tarsal resection. It is of value. The author's suggestion for increasing the effect of tarsal resection is interesting, but it should be regarded only as a suggestion. It is not recommended out of experience. There may be objections to it which the originator cannot foresee.

For some cases of ptosis of more than 4 mm. the Motais idea can be used satisfactorily, but it is a rather difficult operation to perform.

The Hess operation has simplicity and ease of performance to recommend it, but, like other operations which depend on the action of the frontalis, the pull is not in the right direction. Further, there is a tendency toward decreased effect as time goes on after operation. Let me make this suggestion in connection with the Hess operation. If the effect becomes insufficient, tarsal resection can be performed. This has worked out well with me.

Dr. Lancaster's original idea of using fascia lata in operating for ptosis is interesting. Dr. Lancaster was good enough when in New York to demonstrate his operation on the cadaver for me. In working on war

wound cases I have used fascia lata many times, but never for ptosis. I think a word of warning is in place. After the surgeon has cut through the skin and fat in the outer aspect of the thigh he sees the fascia lata as a tense glistening membrane. When a longitudinal incision is made, the wound in the fascia springs open and muscle tissue bulges out in a surprising sort of a way, and after removing a strip of fascia genuine effort is needed to bring together the flaps. At least this is true for young adults. I have never seen fascia lata taken from children. I feel sure that Dr. Lancaster would not recommend the general adoption of his method until he has tried it out in several cases.

Dr. Meyer Wiener: Let me make a suggestion which probably a great many are not familiar with. I find in suture operations on the lid that a little pearl button, like a glove button, through which to tie the stitches, is the best thing we can use. It is clean, easily secured, and the threads slide easily over the button.

Dr. Lancaster (closing discussion): Just a word of caution about the advancement of the levator; it is easy to overdo that. Do not advance too much or you get lagophthalmos.

A NEW METHOD OF MUSCLE ADVANCEMENT

MEYER WIENER, M. D.
LIEUT. COL. O. R. C.
MEDICAL SECTION, U. S. A.

The prime object of a squint operation is to secure the nearest possible permanent normal position of the eyes, so that, directing the eyes either near or far and in any direction, the lines of vision of the two eyes will cross, or seem to cross on the object viewed. There are many ways and methods of achieving this. There are authorities who believe in section of the strong muscle. There are others again who strongly condemn a section of a muscle under any circumstances and believe advancement, resection, or tucking of one or both muscles should be made. The chief advantage of the section is its simplicity. One of the chief objections is, in convergent strabismus, the limitation of movement, and ugly sinking of the caruncle; a frequent complication of section of the externus is more or less permanent diplopia.

Advancement, when properly and successfully performed, is, I believe, conceded to give the most satisfactory and permanent results. Perhaps one of the chief difficulties to overcome in advancement is that of obtaining a good enough bite in the sclera so as to firmly grasp the advanced tendon, without going so deep into the tissues as to perforate, and yet securing sufficient purchase so as to take a firm hold. On this account the methods of procedure are numerous and varied. One of these objections has been met by Howe, who attaches the sutures to the tendons of the vertical recti muscles. The operation is difficult to perform, uncertain in its results, and leaves, as a rule, an ugly overlapping of the conjunctiva over the cornea, which persists for some time. The metal clips, while being more exact, are difficult to place and more difficult to remove.

The method now advocated has as its basis the tying of the sutures over flat metal (gold) plates on the same principle as the tension sutures used in hare lip and cleft palate operations. The gold plates are similar to those used by me in my work on corneal suturing and keratoconus. Gold is preferred on account of its strength when rolled out into thin plates, the fact that it takes a high polish and will not tarnish, making it nonirritating in the tissues. The strips are .005 of an inch thick and .075 of an inch wide, with a .031 of an inch drill hole. The space be-

tween the drill holes is 1.8 mm. and it is absolutely essential that the drill holes be polished to permit easy sliding of the threads without cutting. In this method now described it is not at all necessary to anchor the suture in the sclera, although it can be done if it is so desired. The sutures are passed merely through the conjunctiva and subjunctival tissue close to the corneal margin and tied over the gold plate. In the operation now advocated several advantages are claimed both as to simplicity and efficiency, as well as the ease with which the stitch is removed. The plate

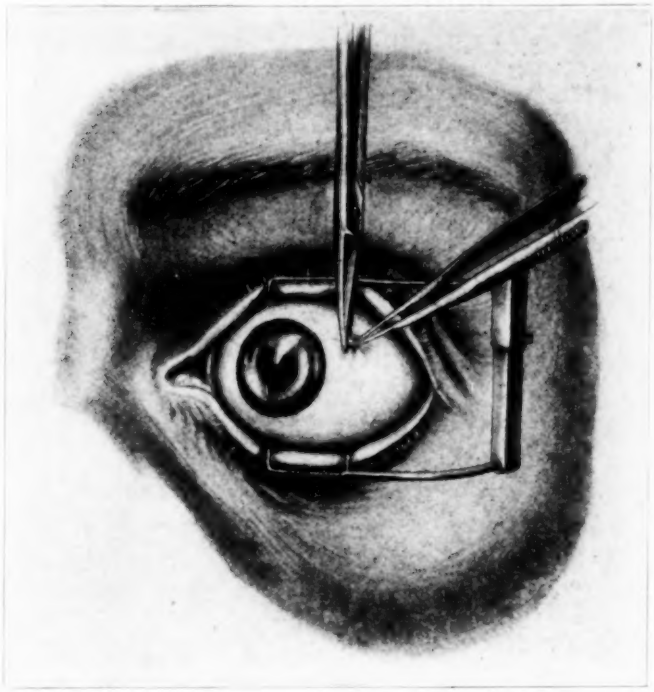

Fig. 1

gives a broad surface, over which the pressure exerted by the suture is so evenly distributed on the conjunctiva that the thread cannot pull through. The bite into the muscle tendon is made so that the thread is not left between the tendon and the sclera, so as to interfere in any way with adhesion taking place. The bite is taken with a very small full-curved needle vertically, just away from the center, and coming out laterally on the surface, near its margin.

When the operation was first performed, the conjunctival

incision was made directly over the insertion of the muscle tendon. This left an unsightly fold of conjunctiva next to the cornea when the suture was tied, therefore the incision was made close to the cornea, about three mm. distance, dispensing with the objectionable fold as well as helping make the operation more bloodless.

If the muscle is pulled forward and the correction is found to be sufficient before the plates are brought together, the sutures may be tied thusly. It probably is a wise procedure to calculate

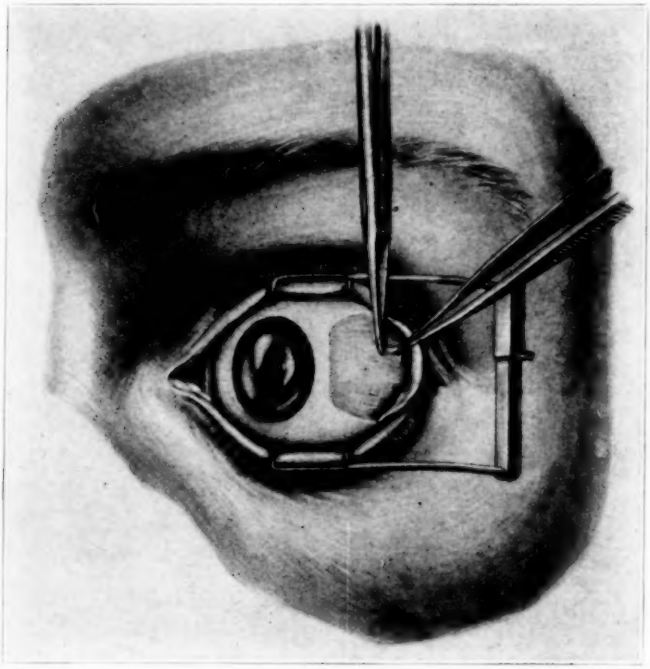

Fig. 2

on their being separated a millimeter or more, which gives one some leeway in producing an ultimate greater effect by the last final pull, if found to be necessary.

It is not advisable to have the plates fold up or overlap, although I have done this on one occasion without any unhappy result. The accompanying illustrations will demonstrate, I think, each step in turn of the technic of the operation.

After having had demonstrated the tremendous tension to which the corneal sutures tied over my gold plates are subjected without pulling through, I felt satisfied that the muscle tendon

could be anchored by a suture passed through the conjunctival tissues at the corneal margin without giving way, providing it was tied over the suture plates. I have operated on 13 patients using this principle and have been firmly convinced that the method used for the operation for advancement has many advantages over any other tried by the author. The method is simple, easily comprehended and performed, efficiently holding the tendon in position; and the stitch can be removed without effort.

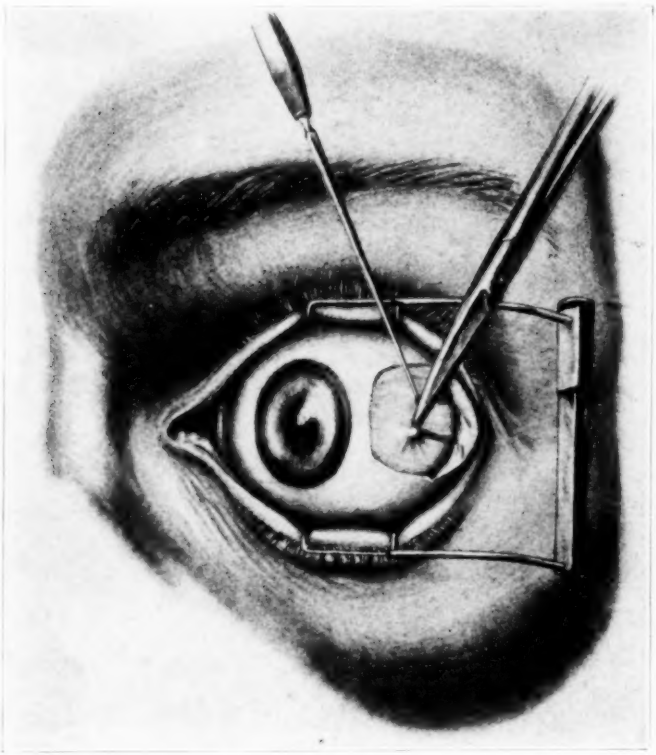

Fig. 3

Shortly before entering the service of the U. S. A. Medical Corps, I performed two operations with the method, using two double armed sutures for anchoring the tension. I afterwards felt that the operation could be greatly simplified without endangering its efficiency by using one double armed suture, and the results have justified this belief.

The operation is performed in the following manner:

A vertical incision is made in the conjunctiva about 3 mm.

away from the cornea toward the insertion of the tendon to be advanced. The conjunctival flap is then dissected back so as to expose the insertion of the tendon. The capsule of Tenon is then grasped with a forceps and snipped with a muscle scissors. Two strabismus hooks are then passed under the tendon, and the exposed tendon stretched between them. A double armed silk suture is then passed in turn, first through one of the suture plates, then through the edge of the dissected conjunctival flap,

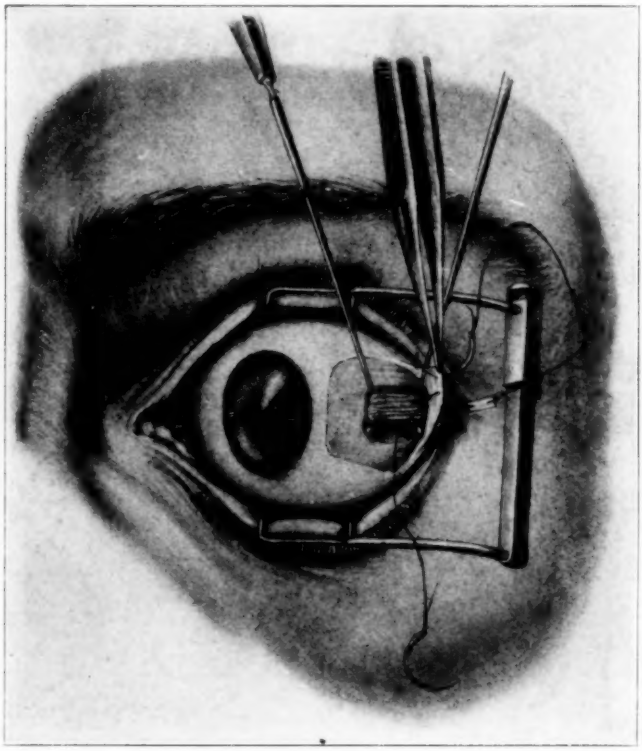

Fig. 4

then through the tendon. The bite in the tendon is taken with a very small, full-curved needle, entering perpendicularly, just away from the center, and emerging laterally, within the margin, on the surface of the tendon. A similar bite is taken with the second needle through the opposite side. If desired, the capsule of Tenon can be included in the suture along with the conjunctiva and tendon. The tendon is then severed from its attachment and the final suturing is through the conjunctiva and subconjunctival tissue next to the cornea, passed through the openings in the

second suture plate and tied, the tendon being drawn up so as to anchor it close to the cornea, and the conjunctival wound being closed at the same time.

If there is only a slight defect, simple advancement will suffice. If the defect be over 25 or 30 degrees, the operation is combined with section of the opposing muscle. It is sometimes necessary to excise a mm. or two of the end of the tendon, otherwise, the cut tendon edge is apt to protrude over the corneal margin if the tendon is drawn too sharply forward.

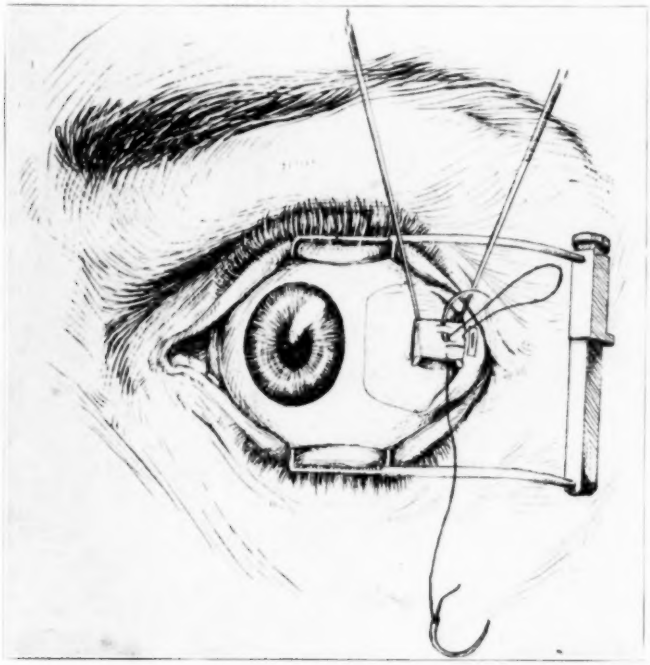

Fig. 5

A bandage is always placed over both eyes to keep them immobilized and permit firm adhesion of the tendon to its new insertion. A great deal of the effect is lost by either leaving one eye open, or taking the bandage off too soon. I generally examine the eyes on the fourth day after the operation. If the eyes are in good position I close them again for two days. If they seem to be over corrected (in operation for convergence) I take off the dressings and instruct the patient to practice convergence. As a rule both eyes are kept bandaged for seven days when the suture and plates are removed and both eyes left open. The following

cases illustrate the degree of defect, with correction after operation.

CASE 1.—M. L. P. Age 22. Eyes always converged. Equal vision in each eye. No diplopia. Operated upon 18 months ago, but helped very little. O. D. 20/20; O. S. 20/20. Congenital concomitant convergent strabismus, fixing equally well with either eye. 30° Priestly-Smith.

Operation, August 30, 1918. Vertical incision of conjunctiva, O. D. 8 cm. long, 3 mm. from temporal corneal margin. Con-

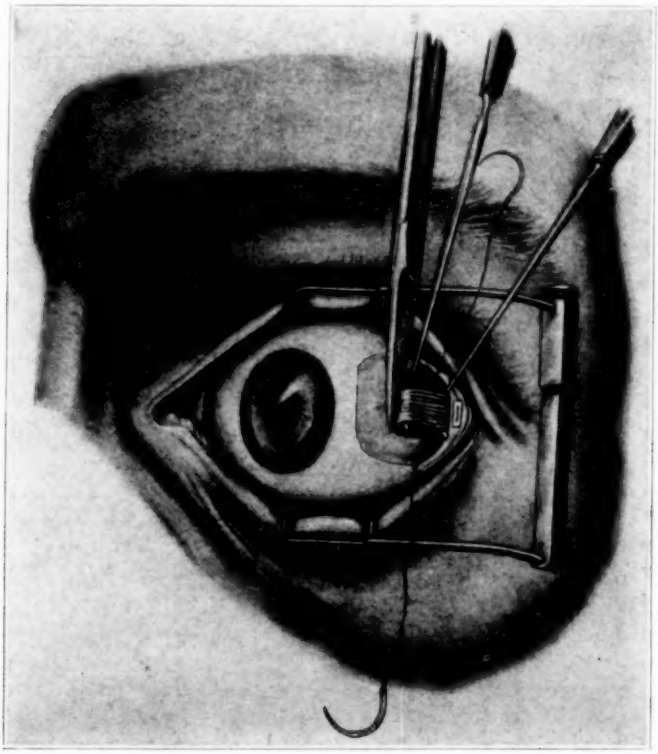

Fig. 6

junctiva dissected back. Capsule of Tenon snipped. Tendon exposed over 2 strabismus hooks. Two previously prepared double-armed sutures passed through gold plate, through dissected conjunctival flap, then through tendon. The tendon then cut, and sutures passed through corneal flap of conjunctiva, then through second gold plate, and tied, the tendon being pulled well forward. Uneventful recovery. Condition at first seemed over corrected. Stitches removed sixth day. With his 1.00 S. ⌒ 0.75 D. cyl. ax. 90 perfect cosmetic result; with Priestly-Smith 5° convergence.

CASE 2.—J. W. E. Age 24. Weakness of eye muscles since

age of 10 following measles. Operated at age of 19 (probably advancement), with considerable improvement. Vision has been failing in right. O. D. V. equals 10/200, O. S. equals 20/20. Pupils normal. Eyes converge 60° Priestly-Smith. Retinoscopy and subjective O. D. plus 1.5 ⊃ plus 1.0 D. cyl. ax. 90°. V equals 20/50; O. S., plus 1.0 ⊃ plus 0.25 D. cyl. ax. 90 V. equals 20/20.

Operation, September 18, 1918. Same as Case 1 except that only one double-armed suture was used with the gold plates and in addition, the internal rectus attachment was carefully severed. Uneventful recovery. Suture removed on sixth day. Slight overcorrection, ten days after operation. Three weeks later apparent perfect result.

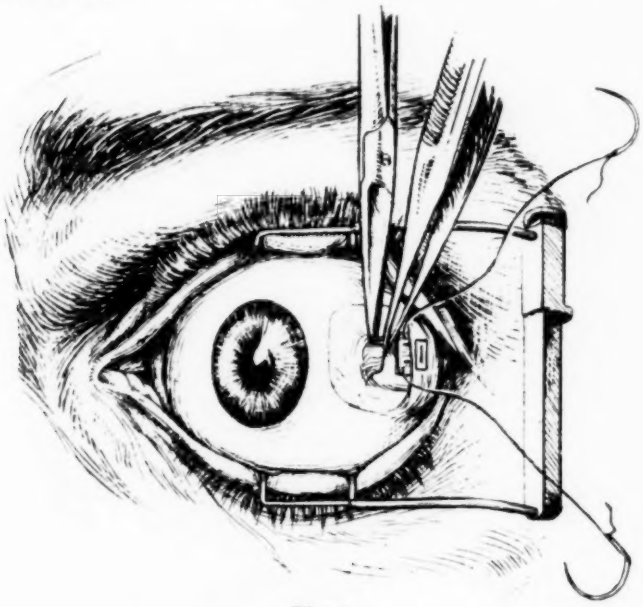

Fig. 7

Case 3.—C. H. Age 22. Has had convergent strabismus since age of 4. Did not wear glasses until August 18. Condition followed diphtheria. Occasional diplopia. Concomitant convergent strabismus of 48°, Priestly-Smith, fixing with left. Refraction O. D. plus 1.25 D. S. V. equals 20/40. O. S. V. equals 20/20. Reflexes and fundus normal. Operation October 12. Complete section of right internus and advancement of externus, same as Case 2. Convalescence uneventful. Less than 5° convergence. Priestly-Smith 2 weeks later.

Case 4.—C. D. Age 25. Eyes crossed since age of two. No diplopia. O. D. V. equals 6/200, O. S. equals 20/20. Concomitant convergent strabismus 45° arc, fixing with left. Reflexes and fundus normal. Operation November 22. Complete tenotomy of right internus and advancement of externus same as

Cases 1 and 3. Convalescence uneventful; 5° convergence remained. Refraction 1.5 D. S. either eye. Given full correction.

CASE 5.—R. T. Age 28. Eyes crossed since age of 5. Has worn glasses since, but become worse lately. O. D. V. equals 20/70. O. S. V. equals 20/50. Concomitant convergent strabismus; 40° Priestly-Smith, fixing with left. Refraction O. D. plus 1.5 D. S. ⌒ plus 0.25 D. cyl. ax. 150. O. S. plus 0.75 D. S. ⌒ plus 0.25 D. cyl. ax. 30.

Operation, November, 24. Same as case 3. Convalescence uneventful. No defect 2 weeks later. Perfect cosmetic result with glasses. No diplopia.

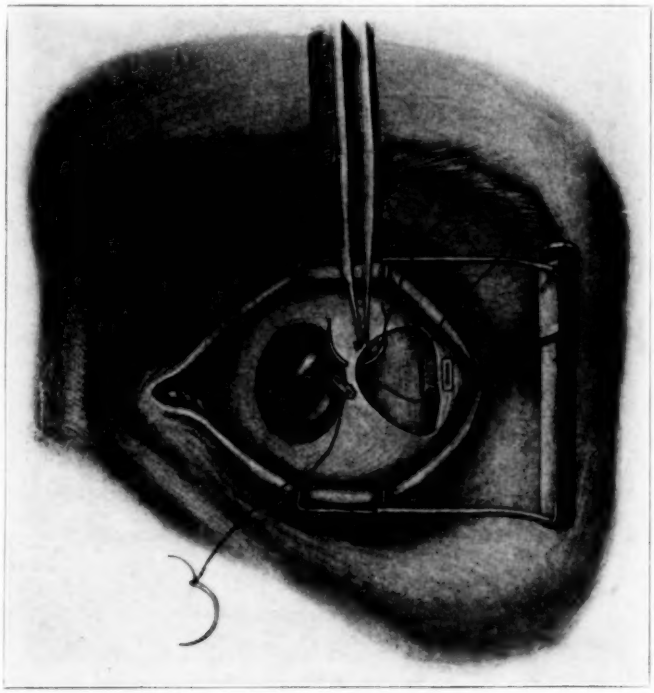

Fig. 8

CASE 6.—I. K. Age 25. Right eye turned in when 10 years old. Never wore glasses. O. D. V. equals 20/70 plus 1.25 D. S. equals 20/30. O. S. V. equals 20/20 plus 0.75 D. S. equals 20/20. Muscular excursions limited in direction of right external rectus. O. D. Converges 20° arc, 52° Priestly-Smith. Operation November 27, 1918. Same as case 5. Perfect result.

CASE 7.—F. D. B. Age 33. Left eye has always crossed. 35° Priestly-Smith, right eye fixing. O. D. V. equals 20/20, plus 0.25 D. S. ⌒ plus 0.25 D. cyl. ax. 180 equals 20/15. O. S. V. equals 20/200 plus 1.0 D. S. ⌒ plus 1.25 D. cyl. ax. 120 equals 20/200.

Operation, November 30, 1918. Advancement of left externus in above described manner but not sectioning internus. Slight over correction immediately after operation. Stitch removed sixth day; 3 weeks later, perfect result.

CASE 8.—H. V. Right eye always turned in. O. D. V. equals 20/70 plus 3.0 D. S. ⌒ plus 1.5 D. cyl. ax. 120 equals 20/50; O. S. V. equals 20/40, plus 2.0 D. S. equals 20/20. Concomitant convergent strabismus, right 65° Priestly-Smith, fixing with left.

Operation, December 4. Section of right internus and advancement of external same as case 6. Recovery uneventful.

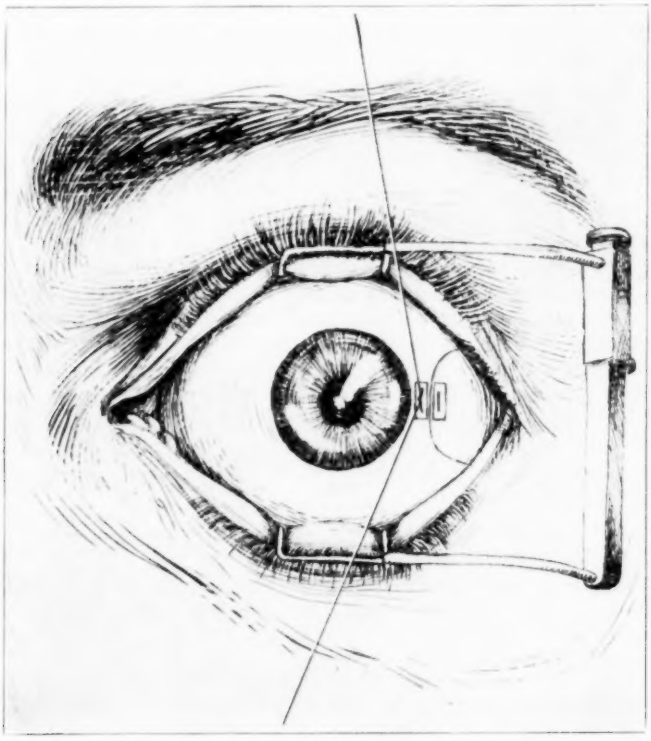

Fig. 9

Stitches removed on 7th day. Had 8° overcorrection at this time, but patient practiced convergence frequently and 3 weeks later operation result was perfect.

CASE 9.—L. W. Left eye always turned in. Was operated upon 3 years ago with no improvement. O. D. V. equals 20/40 plus 1.0 D. S. ⌒ plus 0.5 D. cyl. ax. 90 equals 20/20. Concomitant convergent strabismus of 60°. Priestly-Smith fixing with left. Operation, December 4, same as Case 8. Stitches removed on 6th day. 3° convergence Priestly-Smith, but perfect cosmetic result with his correction.

CASE 10.—H. Y. Age 22. Left eye crossed since 2 years of age. Has worn glasses since. O. D. V. equals 20/100 plus 3.5 D. cyl. ax. 75 equals 20/30. O. S. V. equals 20/100 plus 3.5 D. cyl. ax. 150 equals 20/70. Concomitant convergent strabismus 32° arc, and 62° Priestly-Smith, fixing with right.

Operation December 12. Same as case 9. Stitches removed December 19, 1918. 10° arc convergence remaining 5° with correction.

CASE 11. Miss D. Age 23. Deviation upward of 15° right. Has had several operations, including section of right internus, and attempted advancement of right inferior rectus with section of superior. Operation advancing right inferior rectus completely corrected vertical deviation.

Two other cases were operated upon by me at the Jewish Hospital in St. Louis before entering the service, but the records are not available. The results, however, were equally gratifying.

Nine of the other cases reported were patients operated upon in U. S. A. General Hospital No. 14, at Fort Oglethorpe, Ga., and two at the West Ellis Hospital in Chattanooga, Tenn., through the courtesy of Dr. Francis Hackney. The ease with which the muscle tendon pulls forward is astonishing. I wish to lay stress on the importance of covering both eyes after the operation for at least four days, so as to permit attachment of the tendon in its new berth. It has been my practice to make an inspection on the fourth day. If there is good alignment I rebandage both eyes. If, in a case operated upon for convergent squint, there is a divergence, I leave the dressings off, permitting practice of convergence. In the vast majority of cases, however, it has been my custom to have both eyes covered for seven days, at the end of which time, I remove the bandage and plates.

DISCUSSION

DR. ALLEN GREENWOOD: I said yesterday at the time of Col. Banister's paper that I would discuss his paper in conjunction with Dr. Wiener's and I simply want to add to Dr. Banister's tucking operation a method of tucking that also converts the operation into an advancement. I have done this many times for the past ten years and I am able to get very good advancements without cutting any muscle tissue. It is very simple and easily done (illustrates.) You have the conjunctiva cut with the muscle exposed and then take an ordinary tuck in the muscle. A suture is then passed through each corner of the top of the tuck and then through the episcleral layers so as to fasten the tuck down to the sclera well forward. Then the conjunctiva is fastened over all and in three weeks the bunch is gone. One can pass the sutures, holding down the tuck first, through the conjunctiva and thus fasten all down together. At no time has one injured the middle fibres or the muscle and, as these are brought forward close to the edge of the cornea and held down, I claim we have just as much advancement as other methods and without cutting a bit of muscle or severing the muscle from the globe and without much traumatism and the operation takes less time than a regular advancement. When one has the tuck fastened with two sutures which are brought around and tied tightly the muscle is not likely to pull the stitches out. There is very little tension. Even should the stitches all pull out the

muscle would occupy its old position with nothing lost. It is what I call combined tucking and advancement and what is left of the bunch is very flat and soon disappears. I wish that Dr. Banister the next time he does the operation for the high degree of muscle convergence deficiency would fasten his tuck forward to the sclera.

DR. HAWLEY, of Chicago: I am very glad to confirm Dr. Greenwood's method. If I understand him, he fastens the middle of the muscle. At the Pittsburgh meeting I described nearly the same thing, only in the operation I did, which is a modification of Worth by Woodruff of Chicago, you simply bring it forward and make a new attachment to the tendon. You can get almost any effect you want. Have done it with 45 deg. convergence or divergence. You simply make it at the insertion just as Worth does. In two weeks the bunch has disappeared (illustrates.) Making an incision over the tendon, you dissect back the conjunctiva as far as you want to go, on the muscle, holding back the conjunctiva with a modified lid retractor cut to 9 mm. size, and simply put in a stitch one-third of the width of the muscle, top and bottom, tying lightly (illustrating); bring it forward and fasten through the tendon. You simply make a new attachment of the posterior part of the muscle to your tendon.

DR. E. C. ELLETT of Memphis: In regard to the use of the suture plates, for which I do not think Dr. Wiener claims originality, Dr. G. C. Savage of Nashville has been using something of that sort for more than twenty years in practically all operations on the eye where he uses sutures. As he devised it in the days when a certain citizen of Lincoln, Neb., was in the limelight, he used silver plates instead of gold.

It seems better to me to use for anchorage in muscle operations the stump from which you cut the tendon, as is done in the Reese resection operation, and that you thus get a much more secure anchorage than with a suture which involves only the conjunctiva and episcleral tissues, or even the sclera itself. Moreover, when a muscle is advanced to a new point of insertion in advance of its normal insertion, it has been shown that it attaches itself solidly to the globe as far back as the original insertion, i. e., the stump of the tendon, and the effect of the operation is the same as if it had been attached to the globe at this point. Therefore, you might as well actually attach it there to the stump of the tendon.

DR. WIENER (closing discussion): In the first place, one man objects on the basis that you do not have to go through the scleral or episcleral tissues. I have never seen a single case in which the stitches have pulled through, but I have seen cases in which the conjunctiva stretched. In the early operations this was true because the stitches were not put close enough to the cornea, when you will have no attachments to stretch.

The similar plates of Savage, I have known were used by some one in Chicago, but it was simply plates for the muscle end and the severed end of the tendon, but not in the forward end where the muscle was to be attached, and that is the main issue in the operation.

Dr. Ellett said that theoretically it was right to make a weave, but practically it is difficult. But we weave in and out the muscle and tendon only once, which is not difficult to do with a very small curved needle.

I have never found any serious objection to blindfold a young person, and all these are done on young people. I do not think you can get the best effect without blindfolding them. Landolt always blindfolded his patients and kept both eyes shut a week. I do not keep them in bed, and they walk about and talk to each other, and there is no serious objection as there would be in an old individual.

As to not obtaining enough effect at the first operation, all you have to do is to pull on these threads and tighten them. The threads slip so easily. You have to use no effort whatever. And if you should not get a sufficient effect you can slip the scissors in there and widen it a little.

REPORT OF A CASE SIMULATING BRAIN TUMOR BUT ACTUALLY ENDOCRINOPATHIC IN CHARACTER—CHOKED DISC

ROBERT SCOTT LAMB, M.D.
WASHINGTON, D. C.

For a number of years I have tried to impress upon my colleagues and professional friends the value of ophthalmology in relation to general medicine—in private discussions—and have even gone so far as to write more than one paper in support of this idea. Perhaps it is almost a fetish with me to feel that ophthalmology is not altogether a minor subject in medicine, but rather a useful aid in differential diagnosis. I have always felt that it was entirely too bad that the misconception has arisen as to the field of usefulness for ophthalmology; and that in consequence there has necessarily followed a marked limitation in the expanse of that field. Whether or not this limitation has come about chiefly through inadequacy of ophthalmologists or through the lack of confidence of the profession in their capacity to understand various complicated cases with breadth of judgment, suffice it to say that many of the physicians who do ophthalmologic work are forced to do much refraction and rarely get an opportunity to use their knowledge which is acquired in connection with their specialty.

The following case is reported to substantiate the statement above as to the usefulness of ophthalmology in its relation to general medicine:

Florence M. W., 13 years of age, was brought to my office on October 9th, 1916, by her mother at the suggestion of Dr. Biggs; and in view of the fact that the mother had had a long standing headache cured some six or seven years before.

Her previous history indicates that for a year or more she had been suffering with severe headaches and photophobia; that she had been very nervous; vomiting, at times of a projectile character, was accompanied by terribly severe headaches. She had not menstruated. As I understand she would eat food and go and sit down in a corner and suffer; at other times she would lie in bed without any attempt to arouse herself. She had no interest in life and suffered almost continuously, and exacerbations became as frequent as twice a week just before she was brought

to me. She was about 5 feet 7 inches tall and weighed about 150 to 160 pounds. I am sorry I have not a photograph of her taken at that time. I will, however, submit a photograph taken at 10 years of age—October 2nd, 1913—three years previous to my examination—which would indicate a rather normal child for her years. (Fig. 1.)

Her first visit was devoted to history taking. When examined she was restless and quite indifferent. Her left eye was nearly closed; there was an apparent ptosis of the left upper lid, although not of a paralytic type. It seemed more a matter of intumescence of the lid. In fact the whole face seemed to be swollen; the left side being very much heavier. It looked as if the left side of the chin and lower jaw were growing faster than the right side. The brows were tremendously overhanging—the nose very, very thick—gross—and the whole skin surface seemed to have a

Fig. 1. Photograph of Florence M. W., 10 years of age, taken October 2, 1913.

very dull, heavy, greasy look; the whole physical attitude was one of more or less stupid and uncomprehending animal-like indifference, and suggested nothing so much as a half grown heifer calf.

Her vision in right eye was 6/60; in the left merely light perception—no objects. The next day, October 10, 1916, under atropin there was discovered a definite neuroretinitis—choked disc—in each eye—much worse in the left. In view of the neuroretinitis and general history it was decided to send her into the Emergency Hospital, where other tests could be made.

After consultation with Dr. Biggs the patient was examined by Dr. Hough, a serologist, who was formerly attached to the Government Hospital for the Insane; he reported her reflexes normal and no increase in cerebro-spinal pressure—that the fluid was clear; no increase in protein content and that there were two cells per cc. Noguchi and other tests negative—Wassermann and colloidal gold reactions negative.

Dr. Hiram Reede, an internist, was then called to see the case and went over the reflexes independent of Dr. Hough. He could find no difficulty and could not in any way account for her symptoms. It was thought best to have an x-ray of the head, which was made by Dr. Groover, to ascertain whether or not there was any corroboration of the suspicion of brain tumor. Dr. Groover found very marked corrugations of the inner plates of the skull which were taken to be the resultant of intracranial pressure, perhaps associated with brain tumor.

On October 18th she was refracted by retinoscopy and glasses were prescribed in color because of the marked discomfort to

Fig. 2. Photograph of Florence M. W., 16 years of age.

light and to relieve her in so far as possible from any eyestrain which might contribute to the headache.

The x-ray showed no sign of sinus involvement and an examination by a rhinologist indicated no difficulty from such a source.

After much discussion and consideration I contended that as there was no definite sign of brain tumor and there was no immediate reason for operative interference it would at least be advisable to consider the case as one of probable anterior pituitary involvement—hyperplastic—and underactive gonodal function; and it seemed advisable to attempt some organotherapy in an effort

to relieve the patient of the severe headaches and vomiting, and perhaps, even cure the case in the event the tentative diagnosis were correct. The prompt response to organotherapy and the subsequent history of the case proves conclusively there could not have been any brain tumor. Repeated attempts to elicit any hemianopsia were absolutely unsuccessful until January, 1917, when there was a slight hemianopsia present in the left eye. This subsequently disappeared.

On the 24th of May, 1917, Dr. Groover made roentgenograms of the head and found the corrugations had become much less marked and that the bony structures of the head were practically normal.

On the 12th of March, 1918, her vision without glasses was 20/40 in the right eye and 20/65 in the left.

With glasses— $+0.75 \bigcirc +1.50$ c. ax. 120, O. D. $= 7\frac{1}{2}$
$+0.50 \bigcirc +2.50$ c. ax. 45, O. S. $= 6/15$

Since June, 1917, the patient has been seen once in three or six months; during the entire period, and for one year thereafter, she continued to use the tablets more or less regularly. Since then, I understand, she has not taken them.

Within six weeks after beginning the use of organotherapy—which consisted of lutein, 2 grs. and 1/10 gr. posterior pituitary—she was going out with her friends and seeming rather normal; dancing and taking an interest in everything that was going on. Her present appearance, of course, indicates she has made most astounding improvement over her previous condition; and it is quite a pleasure to realize that she has been spared a possible exploratory, or at least a decompression operation for her violent, acute symptoms pointing towards brain tumor.

CYCLODIALYSIS.

HARRY S. GRADLE, M.D.
CHICAGO

I.

In 1905 at the Heidelberg Opthalmologic Congress, Heine[1] first described an operation which he had performed twenty-six times for the relief of increased intraocular tension. He termed the procedure "Cyclodialysis," a name which has remained. The technic was set forth in detail as were the cases upon which it was tried, followed by a discussion of the modus operandi resulting in a balance of intraocular tension. This latter point will be set forth at length in the subsequent pages. The operation found favor immediately in the Continental Clinics where it was tried extensively on all forms of increased tension; but in this country, only a few operators attempted the procedure.

II.

Following are the steps of the operation:

(a) Usual aseptic precautions with instruments, conjunctival sac, etc.

(b) Curvilinear incision of the conjunctiva, 8 millimeters long and 8—10 millimeters above the limbus.

(c) Free undermining of the conjunctiva toward the limbus.

(d) Tangential incision through the sclera, 6 millimeters long and 6—8 millimeters above the limbus.

(e) Introduction of the cyclodialysis spatula through the incision, hugging the inner surface of the sclera, while a forcible rocking motion thrusts the tip of the spatula into the anterior chamber.

(f) Free sweeping motions of the spatula to the right and left, forcibly separating the adherent ciliary body from the sclera and freeing the chamber angle. Withdrawal of the spatula.

(g) Closure of the conjunctival wound with one or two sutures.

But few of these steps need detailed discussion. The incision of the sclera is the most delicate phase of the entire operation. In his earlier publications, Heine[1] advocated the use of a short keratome for this incision, but a very round-bellied, extremely sharp scalpel has proven more successful. The complete

incision should not be attempted at one stroke for fear of injuring the underlying ciliary body; a more rational technic is a series of short light strokes that eventually separate the scleral fibres without impinging upon the ciliary body. Considerable bleeding accompanies this step and occasionally it is necessary to interrupt proceedings to stop the hemorrhage from the small scleral vessels with tampons soaked in adrenalin.

The introduction of the spatula is the most difficult step in the entire operation. It is absolutely imperative to keep the rounded tip well elevated and pressed tightly against the inner surface of the sclera, while a forward rocking motion wedges it into the anterior chamber. This step is painful despite a preliminary subconjunctival injection of cocain. Failure to adhere to this technic may lead to a perforation of the choroid or an injury to the ciliary body. Fridenberg[21] found that this constituted his greatest stumbling block in the operation. In case either of the above mishaps occur, partial withdrawal and adherence to the proper path will accomplish the desired result. That such an occurrence is not necessarily dangerous may be seen from the following case:

In 1909 this patient was treated for many weeks with the usual miotics. He had a well-advanced glaucoma simplex, with a deep cup, vision almost nil and tension that remained around 60 mm. of Hg. On November 30, 1909, a cyclodialysis was performed. At the first attempt, the spatula entered behind the iris and a trace of vitreous appeared in the wound. There was no undue reaction to the operation and the tension remained subnormal for about three months. It then rose to 47 mm. of Hg, but under miotics, quickly dropped to around 20 mm. of Hg., where it has remained to date. The tension of the eye has been taken every three or four months and it has never been found above 20 mm. of Hg.

Hemorrhage into the anterior chamber may or may not occur, depending upon whether a perforating scleral vessel has been injured or not.

As soon as the tip of the spatula appears in the anterior chamber, a lateral sweeping motion should be made, including at least one-third of the entire periphery and extending well back so as to free the chamber angle as well as separate the ciliary body from the sclera. Hemorrhage is bound to occur during this phase of the operation and it cannot be checked, but will cease of its own accord within a short time. If so desired, the anterior chamber may be emptied at this time, merely by depressing the entire spatula and allowing the bloody aqueous to flow out through the scleral wound. But in case a retention of the

anterior chamber seems advisable, as for example in a hemorrhagic glaucoma, the spatula should be pressed continuously against the sclera, thus keeping the path of exit closed. Upon withdrawal of the instrument, the path closes spontaneously.

The use of atropin following the operation depends upon the case. Should any indications of inflammation be present, a single drop may be advisable; but in the average case *where a cyclodialysis is indicated*, the use of atropin is superfluous. For a more detailed description of the operation, the reader is referred to Heine[1, 2, 3], Denman,[4] and Meller.[32]

III.

The operation of cyclodialysis was conceived on a basis of Fuchs' work on the anterior choroid following cataract extraction. Heine believed that the operation would open a path of filtration from the anterior chamber into the suprachoroidal spaces, thus allowing of a slow absorption of the aqueous,[1, 2, 3, 5]. But the fallacy of this theory was soon shown, partially by the experimental work on animals of Krauss,[6] Judin,[7, 8], and Wichodzeff,[9] and partially by the study of operated eyes by Weekers,[10] Heine,[11] and Stock.[12] Observations based upon animal experimentation alone, are insufficient because of the different anatomic and pathologic conditions present, as was admirably shown by Wernicke.[13] Pyle[22] considered that a cyclodialysis was effective because of a subsequent atrophy of the ciliary body, with accompanying decreased formation of aqueous. But today, the consensus of opinion is that the success of a cyclodialysis depends upon freeing the angle of the anterior chamber, opening the filtration spaces and allowing of a normal escape of the aqueous. But in certain cases, *probably of an inflammatory character,* this mode of exit becomes closed, subsequent to the operation and the cyclodialysis is termed a failure. In all likelihood, there exists an inflammatory formation of fibrin which clogs the filtration angle and lodging there, becomes organized. But to determine a priori which cases will react in this manner is impossible. It is probable that the younger the individual is and the more inflammatory his reaction toward the known trauma of operation and the unknown etiologic factors of increased intraocular tension, the less will be the chance of a successful result of a cyclodialysis. The following case is illustrative of that point:

In 1914 a young woman, aged 35, was refracted under hom-

atropin and her right pupil remained dilated subsequently. When seen, three months later, her right pupil was 6 mm. wide and rigid. There was no excavation of the disc; the tension was 60 mm. of Hg.; the vision was 0.6. The usual miotic treatment was attempted for one month, but without success. A cyclodialysis was performed in April, 1914. One week later the tension was 31 mm. of Hg. and it rose continuously for a month, when it registered 58 mm. of Hg. A corneo-scleral trephining was then performed and the tension has remained normal ever since. The vision has remained at 0.6.

On the other hand, cyclodialysis has proven very successful following an iridectomy that has failed to reduce intraocular tension permanently. Such cases have been reported by Knapp,[14] Denman,[4] and Heine.[11] In fact, Knapp[14] considers that the failure of an iridectomy to maintain normal intraocular tension constitutes the main indication for cyclodialysis. In these cases the effect is probably due to the opening of the chamber angle, which was closed by organized adherence of the root of the iris.

IV.

Even more important than finished technic is the proper selection of cases upon which to perform the operation of cyclodialysis. Owing to the character of the operation and its modus operandi, *increased intraocular tension alone is not an indication for cyclodialysis.* This mistake was made during the first few years of the operation and many of the unfavorable results were due to injudicious selection. Witness, for example, the case reports of Stock,[12] Elschnig,[15] Boldt,[16] Krauss,[6] Judin,[7] Meissner and Sattler,[18] Waldstein,[19] Morax and Fourrierre,[20] Knapp,[14] and Heine.[11] In one of his later papers, Heine[23] laid down absolute indications and contraindications for the use of cyclodialysis in terms that cannot be improved upon:

"The more acute the glaucoma and the more urgent the indications for immediate operation, the greater are the indications for iridectomy; the more chronic the glaucoma and the less urgent the indications for immediate operation, the more favorable will be the results of a cyclodialysis."

Compare this with the indications pointed out by various authors:

Knapp[14] considers cyclodialysis to be indicated in cases of advanced chronic glaucoma where an iridectomy has failed to reduce the tension. Stock[12] prefers to do a cyclodialysis in cases of chronic inflammatory glaucoma and glaucoma simplex where from the character of the case, an operation is to be feared and

he considers the operation merely as a preliminary to a subsequent iridectomy.

Elschnig[15] advises that in glaucoma simplex and in fresh inflammatory glaucoma, a cyclodialysis be tried and if not successful, be followed by other operation; in all other types, it is the operation of choice. Zentmayer[24] recommends cyclodialysis in the operative treatment of absolute glaucoma.

Gradle[25] advocates a cyclodialysis in cases of glaucoma simplex on the basis that if successful, a maximum of good has been done with a minimum of harm; but if unsuccessful, there has been no bar introduced to the resort to further operation of greater severity.

Posey[62] prefers a cyclodialysis if there is any evidence of hemorrhagic tendency or if the visual field is reduced greatly.

Practically all operators have found that cyclodialysis is highly successful in noninflammatory absolute glaucoma. This has been particularly emphasized by Meller[17] and Zentmayer.[24] The following is a typical case of this character:

An aged negro was seen with an absolute bilateral glaucoma. One eye was painful and had a tension of 75 mm. of Hg. A cyclodialysis was performed upon this eye and tension promptly sank to normal, where it remained for the seven months that he was kept under observation.

Summed up briefly, the indications for cyclodialysis may be stated as follows:

(1) Glaucoma simplex that has failed to respond to continued miotic treatment, and in which there is but little evidence of an inflammatory reaction.

(2) Borderline cases of chronic inflammatory glaucoma where an iridectomy is to be feared or where the visual field is greatly reduced.

(3) Acute inflammatory glaucoma with a hemorrhagic tendency.

(4) Noninflammatory absolute glaucoma.

(5) Any case of glaucoma simplex in which a more severe operation is feared and which can be watched carefully for a long period of time.

(6) Any eye with increased tension upon which an unsuccessful iridectomy has been performed.

The contraindications are less specific:

(1) Acute inflammatory glaucoma.

(2) Chronic inflammatory glaucoma of the exudative type.

(3) Glaucoma simplex in a young individual which resists miotic treatment.

(4) Buphthalmus.

V.

Judging from the earlier reports, the results of cyclodialysis were not particularly favorable from the standpoint of immediate or permanent reduction of intraocular tension. Thus Stock[12] reported five cases with three failures; while Weekers[10] recorded five successive failures. Krauss[6] condemned the operation on the basis of two unsuccessful cases, as did Judin.[7] Morax and Fourrierre[20] had poor results with one case and abandoned the method. An analysis, of these cases will, however, vitiate the unfavorable figures, because in nearly every case, the operation was not based upon the proper indications or else was attempted as a stop-gap when repeated iridectomies had failed. This was clearly shown by Pyle.[27]

A careful selection of cases in the hands of competent operators led to more successful results. Wernicke[13] found that among sixty-one cases observed for a period of two years, 57 per cent. were permanently improved and that in the cases where one eye was iridectomized and its fellow subjected to a cyclodialysis, the results were about equal. Ohm[28] was particularly successful in the two cases upon which he tried the operation. A drop of tension to normal with a marked improvement in central vision and visual fields was reported by Zentmayer[29] in three out of the four cases thus operated upon. Brown[30] had one case completely relieved by cyclodialysis. Three cases with results that were permanent during the period of observation were recorded by Denman.[4] Elschnig[15] performed cyclodialysis one hundred and nine times on eighty-five eyes with permanent results in fifty-four of the eighty-five. Thirty-seven cases were operated upon by Boldt[16] and in thirty-one of them there was an improvement which proved permanent in twenty-five. Small[31] added one case to the number of good results reported. Meissner and Sattler[18] made a careful study of fifty-four operations of cyclodialysis and reported 28 per cent. good results; as a good result they termed a case where the tension remained normal for six months or more and where the central vision remained equal or improved. One hundred and seventy-six cases were reported from the Elschnig Clinic by Waldstein[19] with approximately the same results as in the earlier Elschnig report. In his last paper, Heine[11] analyzed ninety operations upon seventy-nine eyes; in seven, there was no result; in twenty-three there was a temporary result necessitating further operative interference; in thirty-four the result was good, but the period of observation was too short

to call the result permanent; in twenty-six the result was good for more than nine months. Meller[17] obtained permanent results in 40 per cent. of the cases, temporary relief in 30 per cent., and no result in 30 per cent.

From these figures, it can be seen that experienced operators who have tried the operation over a larger series of cases, have had fairly uniform results. The figures given by Meller[17] are somewhat lower than the average obtained by an analysis of the cases reported in detail. Thus sixteen operators presented three hundred and seventy-one cases with two hundred and eleven good results (57 per cent), fifty-four temporary results (14.5 per cent.), and one hundred and six failures (28.5 per cent.). Absolute reliance cannot be placed upon these figures because some of the cases were not observed a sufficiently long time to insure their proper placing. This would tend to reduce the percentage of good results and increase the percentage of temporary results.

The operation cannot be properly adjudged by the results of any one operator, nor any series of operators unless certain set rules are observed; there must be a proper selection of cases; and the cases must be watched and studied for from six months to two years after operation. The proper selection of cases has been discussed, but the proper tabulation of results is equally important and the tabulation must be based upon the behavior of the central vision, the visual fields, and the intraocular tension.

After a successful cyclodialysis, an improvement in central vision is not to be expected because, in a case suitable for this operation, the impaired vision is due to pressure death of nerve fibres and retinal elements, rather than to the active manifestations of pressure. Consequently, relief of increased intraocular tension can have no influence upon the degenerated nerve elements. If the operation is a success, the vision should show no further decrease, provided nutritional disturbances of the lens have not made their appearance. But if beginning opacity of the lens is present, it is not unusual for the opacity to proceed until it becomes complete.

A sixty-seven year old man appeared with a glaucoma simplex of one year's duration. The vision was reduced to fingers at two meters, owing to lenticular opacities. The tension never was above 47 mm. of Hg. After miotic treatment for eleven months, a cyclodialysis was performed. The vision gradually decreased, although the tension remained about normal. Fourteen months after the original operation, the tension rose to 40 mm. of Hg., but was easily controlled by miotics. In view of the advancing opacity of the lens an iridectomy was performed and through

the resultant coloboma, it could be seen that the lens was completely opaque. The patient died of an intercurrent febrile complaint before the lens was extracted.

The behavior of the visual fields is influenced to a great extent by the same factors that control the central vision. The regular contraction of the field is due to the increased intraocular tension and its uniform pressure upon the periphery of the retina, whose fibres are subjected to increased pressure over a longer distance than are the fibres from the more central areas. This is shown by the fact that the visual field is contracted before an enlargement of the blind spot occurs. The irregular indentations in the visual field are due to the increased pressure upon the nerve fibres as they pass over the edge of the cupped optic disc, pressure, as it were, upon a knife edge. If the increased pressure has existed a sufficient length of time to cause a death of these nerve elements, a successful cyclodialysis will not increase the size or regularity of the visual fields; on the contrary, there will be a slight decrease owing to the advancing atrophy which cannot be stopped merely by a resumption of normal intraocular pressure. On the other hand, if the increased pressure is of recent origin, a successful operation will restore the visual fields to approximately their normal condition, because in the early stages, the contractions are merely due to a pressure blocking (which would eventually lead to atrophy). Complete abolition of the central field, such as occasionally occurs after iridectomy, has never been reported as a sequel to cyclodialysis.

The intraocular tension is, after all, the most reliable index as to the success of an operation. It is undoubtedly true that the tension as recorded by any of the existent clinical tonometers is not the actual intraocular tension as measured by the proper manometer. But the difference between the tonometric tension and the manometric tension, *for any one eye,* is constant and therefore the clinical tonometer is accurate in that it gives a comparative measure of the intraocular tension of an eye from one period to another. (Parenthetically speaking, with this thought in mind, it is to be regretted that a recently devised tonometer is provided with a scale that does not agree with those already established in clinical use, any more than it agrees with the absolute manometric tension.) Consequently, the measurement of intraocular tension for a period before and after operation furnishes a definite guide as to the behavior of the eye and the success or failure of the operation. After a successful cyclodialysis, the tension may drop immediately to subnormal, especially if the

anterior chamber has been emptied during the course of the operation and may remain so for several months.

In 1907, a thirty-six-year-old woman was found to have a tension in the left eye that was questionably plus 1, but distinctly more than in the right. The disc was excavated with a sharp nasal border and slope on the temporal side. The vision was 20/70 and could not be improved. Under eserin the tension did not change. Three years later, she instilled a drop of atropin designed for her daughter. When seen three weeks later, there was a total cupping of the disc, the tension was 60 mm. of Hg. and the vision was 40/100. Efforts were made for three months to control the disease with miotics and subconjunctival injections of sodium citrat, but without avail. A cyclodialysis was finally performed following which the tension sank to 11 mm. of Hg., where it remained for about three months. It gradually rose to 20 mm. of Hg., where it remained for the fourteen months longer that she was under observation.

On the other hand, in an equally successful operation, the tension may remain high for from three to seven days and finally become subnormal for a short period, after which it gradually climbs to normal. Cases that behave in this manner are particularly apt to be successful. (Meller.[17])

Frequently a cyclodialysis will be successful in maintaining normal tension for several months or even years, but eventually there will be a gradual increase in tension that threatens the life of the eye. Such cases are particularly apt to yield to a second or even a third operation and remain normal ever after.

In November, 1909, a forty-two-year-old man came with a glaucoma simplex in the left eye. The disc was incompletely cupped, the vision was 40/70, correctable to 40/50 and the tension was plus one. Treatment with miotics was pursued for nearly three months, but the tension remained around 37 mm. of Hg. In January, 1910, a cyclodialysis was performed. The tension remained normal until the end of March and then rose to 34 mm. of Hg., from which height it could not be reduced. In May, 1910, a second cyclodialysis was performed and the tension again sank to normal and remained there until July, 1912. Then it rose to 37 mm. of Hg. and again could not be controlled. In September, 1912, a third cyclodialysis was performed. Following this the tension sank to normal and has remained there to date, being measured every four months. In July, 1919, the tension was 22 mm. of Hg. and the corrected vision was 0.9.

But in the cases where the intraocular tension falls to normal or subnormal immediately subsequent to a cyclodialysis and then becomes pathologically high within a week to a month, there is no object in repeating the operation. For a second or a third cyclodialysis will be no more successful than the first and another type of operation must be resorted to.

One final word regarding the prognostic value of intraocular tension, both before and after operation. P. Knapp[33] showed that the tension of the normal eye is reduced on an average of 8.91 mm. of Hg. by three minutes of deep massage, although this reduction is temporary and disappears within about twenty minutes. This procedure is of inestimable value in glaucoma, for it permits of a knowledge of the condition of the drainage of the aqueous. A failure to reduce intraocular tension by two or three minutes massage by more than 4 mm. of Hg. is indicative of blocked outlets and must be taken into consideration in forming the prognosis.

VI.

(1) Cyclodialysis is an operation that decreases increased intraocular tension by freeing the angle of the anterior chamber of adhesions.

(2) The particular indications for the use of cyclodialysis lie in the essential chronicity and freedom from inflammatory reaction of the disease.

3. Cyclodialysis is distinctly contraindicated in acute glaucoma, in glaucoma of an exudative or inflammatory type, and in cases where immediate operation is desirable.

(4) The effects of a cyclodialysis must be judged by the behavior of the central vision, the visual fields, and the intraocular tension.

(5) In about 50 per cent of the cases with proper indications, cyclodialysis is successful; in about 20 percent of such cases, it produces temporary results that usually become permanent by a second or even a third operation; in about 30 per cent. it is a failure.

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DISCUSSION

Dr. Jos. Lichtenberg, Kansas City: Dr. Gradle's paper is characteristic. The field is so well covered that there is little left to add or to criticise. The most important part of the paper is the clear-cut description of the indications and contraindications for the operation of cyclodialysis. The experience that we have had with this operation is so limited that we cannot speak authoritatively. We did the first one about a year or two after Heine's article appeared. The result was not favorable and deterred us from using this operation in other cases. While in the Elschnig clinic in 1911 we performed our second operation with good results, and since then two others in which the results were only fair. Undoubtedly we did not choose our cases properly, according to the conditions outlined in Dr. Gradle's paper, and this was an important feature in the results obtained.

The only possible indication for this operation not mentioned in this paper is where the anterior chamber is so nearly obliterated by the pushing forward of the lens and iris that an iridectomy would be practically impossible. Here cyclodialysis could be employed in attempt to cure or as a preparatory operation for the more radical one of iridectomy, corneoscleral trephining, etc.

It will be noticed, looking over the bibliography, that nothing has been written on the subject since 1915. Possibly the war activities have had something to do with this, or possibly the operation is not being used as much as formerly, or after years of trial, judging from the indications for the operation as outlined, the causes for this operation fall within a limited field.

For those interested, a clear-cut description of the operation, well illustrated, will be found in Meller's work on Ophthalmic Surgery, which is the book most available to those not reading foreign languages.

AN OPERATIVE PROCEDURE FOR KERATACONUS, WITH A REPORT OF TWO CASES

A. S. GREEN, M.D., and L. D. GREEN, M.D.
SAN FRANCISCO, CAL.

Of the various pathologic conditions of the eye for which operative procedures have been devised those for the relief of kerataconus have been among the least satisfactory. But if the literature be carefully scanned the conclusion must be reached that the most successful procedures have been those that reduced the intraocular tension.

Thus as far back as 1811, repeated puncturing of the cornea at the periphery was performed. Tyrell later advised a peripheral iridectomy. Critchett produced a prolapse of the iris and ligated it. Van Graefe, Bowman, Swanzy and others either excised, trephined or cauterized the apex of the cone. All of these procedures, either intentionally or otherwise, lowered the intraocular tension temporarily or permanently.

Whether the cause of the protrusion be malnutrition, a refractive error, lid pressure or a disturbance of internal secretion either separately or collectively, it would seem to be selfevident that although apparently normal to palpation, for that particular eye the intraocular tension is too great.

The beneficial results obtained from the use of myotics as suggested by Jackson and others would also tend to support that view.

Reasoning along these lines it occurred to the writers that a procedure that would permanently lower the intraocular tension and reduce excessive lid pressure, would check the progress of the disease.*

METHOD OF PROCEDURE

To overcome excessive pressure by the lids, we first do a canthoplasty, a suggestion made by Dr. Edmund E. Blaauw, severing the orbicularis at its insertion by cutting the external canthal ligament. This is done on both eyes. The lids for the canthoplasty are anesthetized by injecting five minims of ½% novocain solution into the skin at the external canthus. Four or five drops of 4% cocain are meantime dropped into the cul-de-sac at intervals of three minutes, a drop of adrenalin being added with the

*With the exception of the canthoplasty we have been performing this operation also for glaucoma for the past two years and have found it more satisfactory than any other method.

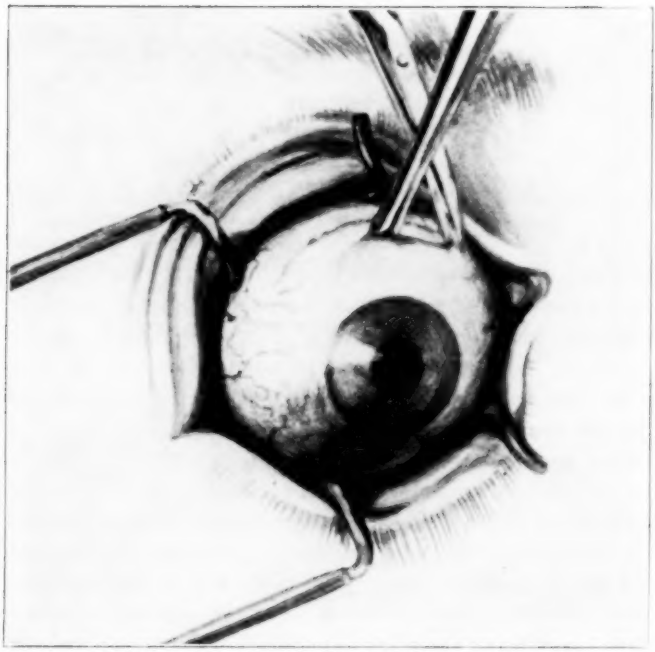

Fig. 1 Conjunctiva incised horizontally

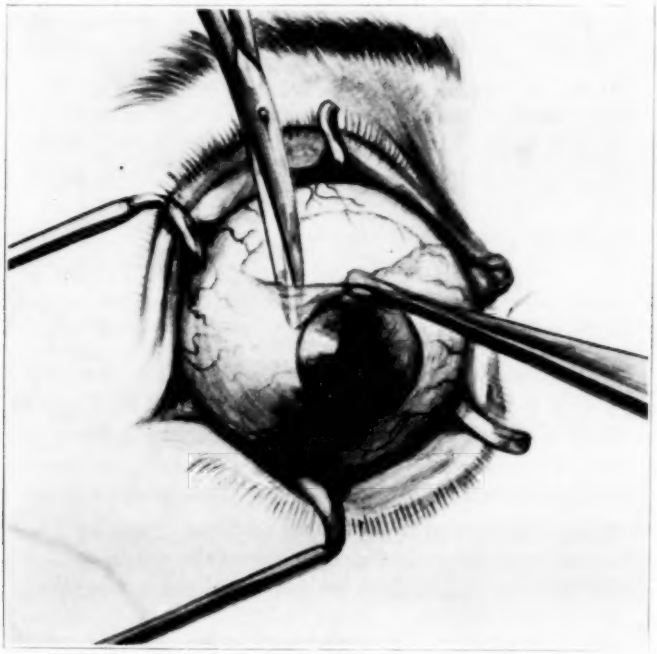

Fig. 2
Conjunctiva undermined to the limbus with sharp pointed iridectomy scissors

last drop of cocain. Three sutures are then put in uniting the conjunctiva to the skin at the external canthus. This practically eliminates excessive lid pressure.

The next step is on the eyeball. This a modification of the operation done by La Grange for glaucoma. A fold of conjunctiva is seized about one centimeter from the limbus above, incised horizontally and undermined as though performing an Elliot operation, splitting the cornea with a slightly dulled keratome for a distance of about 2 mm. The conjunctiva is then pulled down and a small Graefe knife introduced at the limbus as for a cata-

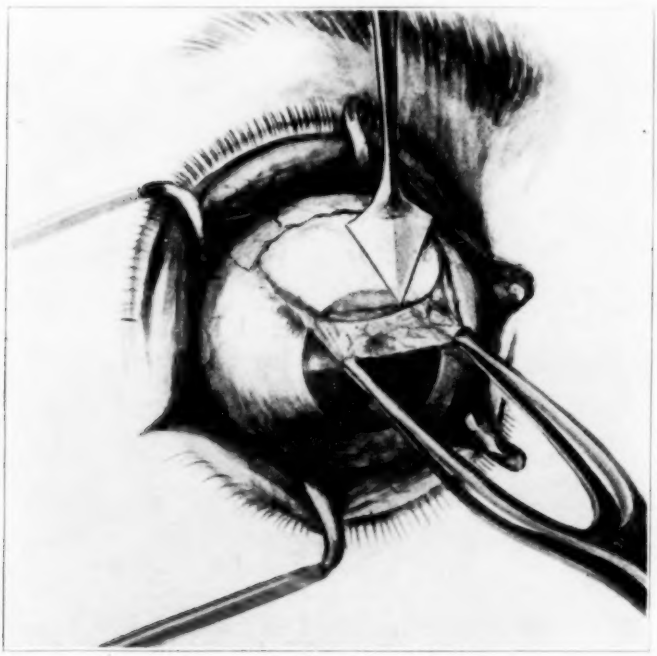

Fig. 3
Splitting of cornea with a slightly dull keratome for a distance of about 2 mm.

ract operation, coming out at the opposite side, the length of the incision being about 10 mm. The knife is carried slowly upward in the anterior chamber close to the root of the iris, leaving a crescent of sclera about 8 mm. long by 3 mm. wide, attached to the conjunctiva. This shelf of sclera is cut off with a delicate straight scissors. An iridectomy is next performed. The pillars are then straightened out, one suture inserted to unite the conjunctiva and the eye bandaged. The operation is practically painless and bloodless.

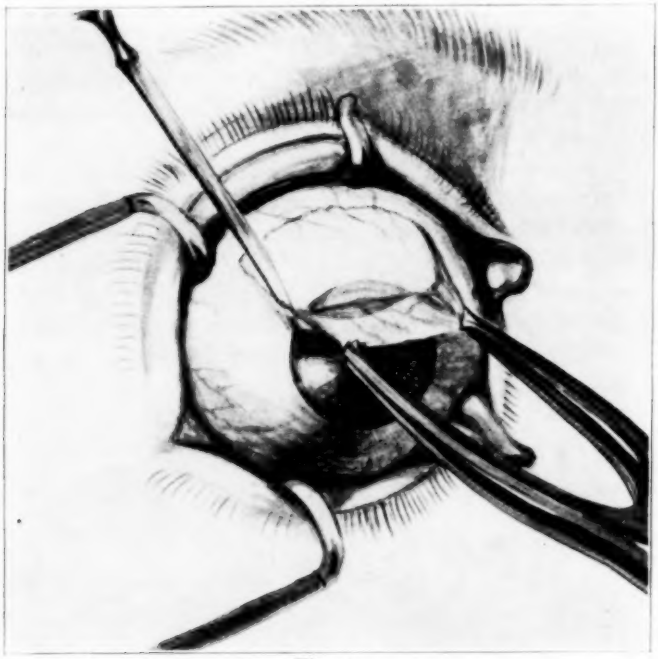

Fig. 4

The flap of conjunctiva pulled forward and a small Graefe knife introduced at the angle into the anterior chamber

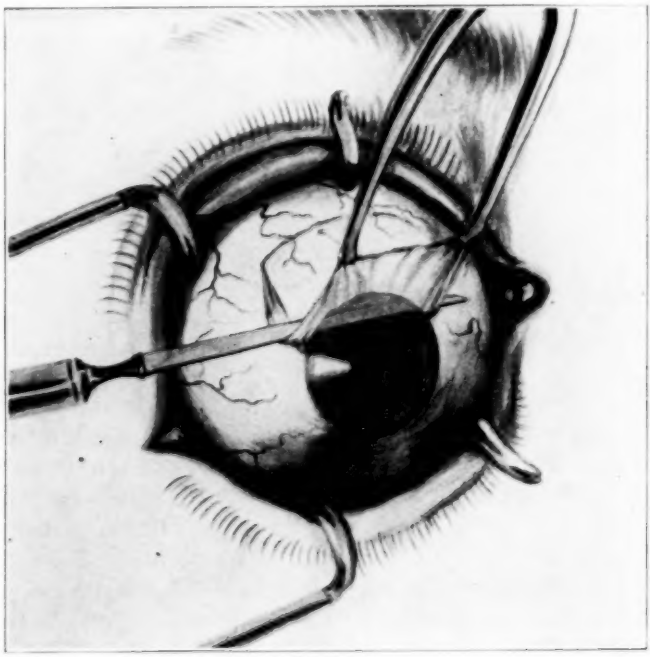

Fig. 5

Graefe knife within the anterior chamber, the point of counter-puncture being about 10 m. m. from the puncture, the knife being carried slowly upward, coming out above the limbus in scleral tissue.

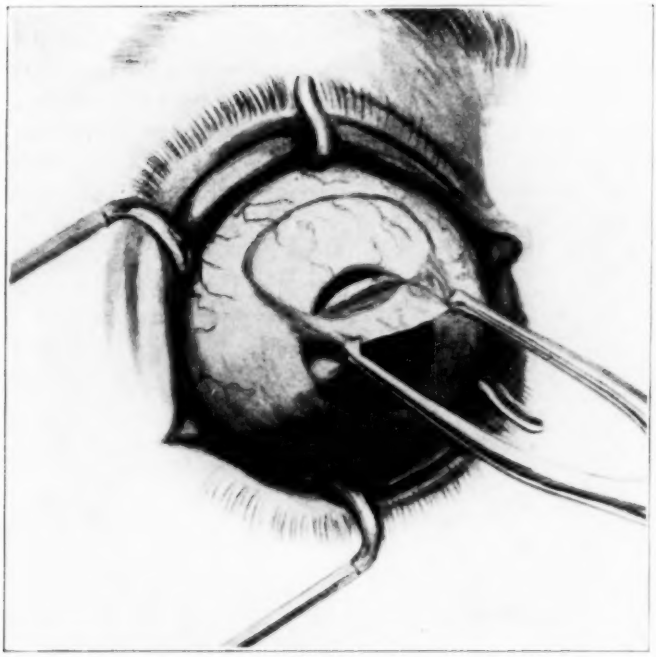

Fig. 6
Conjunctiva pulled forward, showing projection of sclera to be cut off

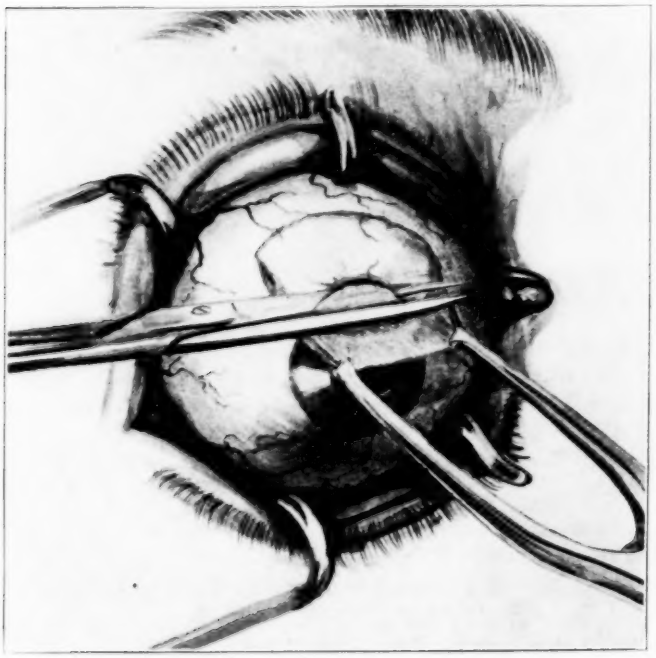

Fig. 7
Shelf of sclera is cut off with delicate straight scissors

The advantages of this procedure are that it has a tendency to permanently reduce intraocular tension, reduces corneal opacification, is not complicated, causes very little reaction and no additional scarring of the cornea.

The following cases were operated upon by this method:

CASE I. R. M., male, age 24. Occupation, engineer. September 17th, 1918. History: Measles at age of six, poor sight since then. Wearing glasses about ten years.

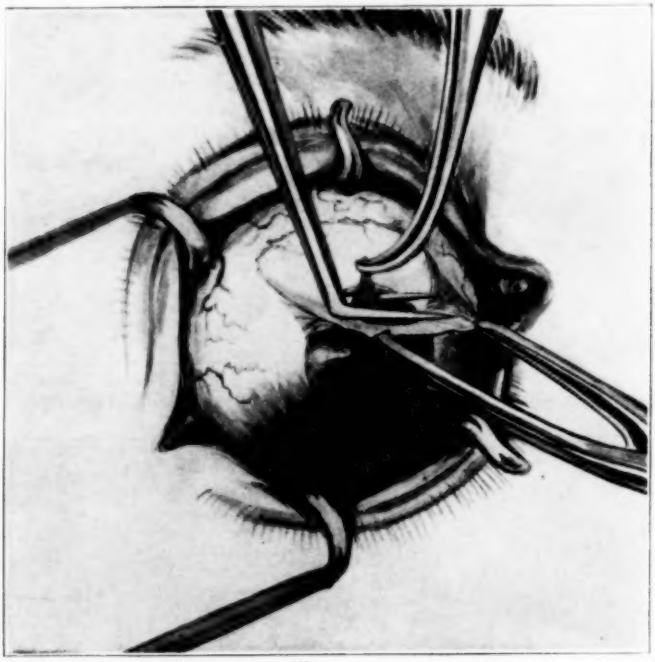

Fig. 8
Iridectomy

Examination: Right, $-3.50 \bigcirc -4.50$ ax $90 = 4/60$
Left, $-0.75 \bigcirc +6.00$ ax $180 = 4/7.5$

Marked conical cornea of both eyes. There was a nebula below the center of the right cornea. Correction of the refractive error and treatment with pilocarpin resulted in no improvement in the right eye but raised vision in the left eye to 4/6. As he was suffering from photophobia and headache an operation on the right eye was advised. This was performed by the above method on Oct. 12th, 1918, and on Oct. 18th, 1918, the patient was discharged from the hospital. There was very slight photophobia or injection.

Jan. 20th, 1919—Right, $-2.00 \bigcirc -2.50$ ax $60 = 4/10$
Left, $+5.00$ ax $180 = 4/7.5$

CASE II. Mrs. H. W. W., age 28. Jan. 2nd, 1919. History: Vision has been gradually failing for the past seven or eight years

without apparent cause. Has always enjoyed good health. Has marked photophobia. For the past five years has been wearing Right, — 1.00 ⌒ + 4.00 ax 165; Left, — 1.00 ⌒ + 5.00 ax 180.
Examination: Right, —1.50 ⌒ + 4.00 ax 165 and pin-hole = 4/6
Left, —1.00 ⌒ + 5.00 ax 180 and pin-hole = 1/30

Right cornea conical but clear. Fundus normal. Left cornea extremely conical. Under the corneal microscope the apex of the left cornea was found to be slightly flattened, about 4 mm. in diameter and below the center. The corneal substance in that

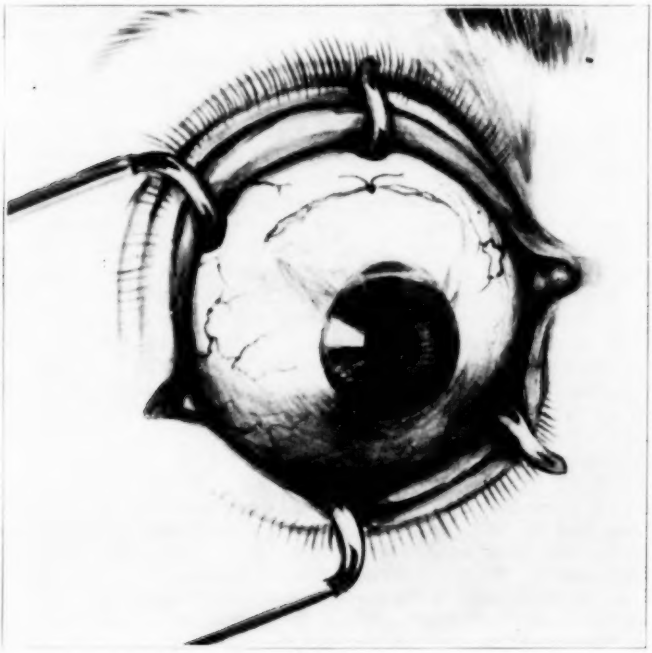

Fig. 9

Pillars of iris replaced, conjunctival flap held in position by one suture. The small dark crescent shaped area above limbus marks the spot from which the shelf of scleral tissue was removed.

area appeared opaque, mascerated and distinctly thickened, having a spongy appearance with fluid in the interstices.

The left eye was operated upon Jan. 7th, 1919. On Jan. 9th the dressings were removed and scarcely any reaction was present, while the cornea was considerably clearer than before operation. The stitches were removed on Jan. 13th and the patient discharged from the hospital. There was only a faint nebula left at the apex.

Jan. 15th: Left, + 2.50 ax 180 = 4/15
March 8th, 1919: Right, — 50 + ⌒ 10.00 ax 165 = 4/7.5
Left, + 2.00 ax 180 = 4/15

Left cornea shows a very faint opaque line in place of the circular opacification.

In comparing the progress of the two eyes in the second case, it will be seen that in spite of the canthoplasty on the right side the astigmatism increased while the vision decreased, showing that reducing lid pressure by itself is insufficient. In the left eye, however, vision was markedly improved, while the astigmatism was reduced to less than half of what it was before operation.

DISCUSSION

Dr. Banister, Omaha: I was very much interested, as we all have been, in this paper, and I would like to ask the writer, as a matter of fact, why would not the Elliot operation be sufficient? That is an ideal operation, and it seems in the method presented there is more traumatism than in simply turning the anterior flap back and going in at the corneo-scleral junction with the trephine. I ask for information, why would not the Elliot operation be as efficient in keratoconus?

Dr. Meyer Wiener, St. Louis: It is hard for me to reconcile the fact that he has only 1D in one meridian and 5D in the other meridian in advanced keratoconus. I have never seen a case without a very high minus glass and with a high astigmatism. I am not questioning his statement, but cannot reconcile it with my experience. One statement is that his method is the safest. It may be the easiest, but I claim my method is the safest, because I do not open the anterior chamber and subject the interior of the eye to infection. It is, I think, a more difficult operation, but could be easily performed by any one with practice and experience. The result does not depend upon the reduction of tension at all, but on reduction of curvature. This may have to do with the results obtained by Dr. Green (illustrates.) He takes out a portion of the sclera at the upper border of the cornea, and we know in the Lagrange operation there is always more or less varying of that opening. We get this, which tends to pull the cornea flatter.

Dr. E. E. Blaauw, Buffalo: I think external canthotomy should be done much more than it is, as it is one of the nicest ways to get reduction of pressure of the lids. What strikes me in a contention about keratoconus is that we talk about something we don't know much about. It is a self-limiting disease. You do not know when it is going to stop in its evolution, and I find it hard to decide when to operate and when not.

I cannot agree with Dr. Wiener in cutting out a healthy part. We find in the central part of the cornea, where it is the thinnest, hyalin degeneration. I feel Dr. Green has attacked the problem of improvement with his juvenile force and vigor, but I am getting too old for these things, namely operative interference without strict indications.

Dr. C. W. Hawley, Chicago: My experience in this is nil. I simply want to give our friend from St. Louis one case that is all plus. I presume it was a case of high plus (before the conical cornea came) and the reduction was not enough to change it to a myopic condition.

Dr. A. S. Green (closing discussion): It has been suggested by Elliot that his operation might be used for conical cornea.

As the good results, in our opinion, in treating this condition depend upon decreasing the intraocular tension, I presume it would be as good in the hands of those who get good results with trephining for glaucoma. But in our opinion our modified operation is safer than the Elliott or the Lagrange, eliminating the uncertainty in cutting over the ciliary region with a trephine and giving a better protective flap than that of Lagrange.

Dr. Wiener contends that his operation is safer. That may be so. But his method would have a tendency to increase the intraocular tension while our purpose is to reduce the tension.

TRANSACTIONS

OF THE

TWENTY-FOURTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

OTO-LARYNGOLOGICAL DIVISION

HELD AT

CLEVELAND, O.

OCTOBER 16, 17, 18, 1919

THE PREPARATION OF A PATIENT PREVIOUS TO TONSILLECTOMY, AND CARE AFTER OPERATION.

GEORGE W. SPOHN, M. D.
ELKHART, IND.

It is a known fact, that some patients, to make a good recovery, need preparation, before operation. It is also known that some patients make a good recovery without any preparation.

Some operators claim patients need *no* preparation previous to operations, nor special care after operations. The recovery of a patient after an operation depends upon the ability of the system to restore itself to the normal. The ability of the system to overcome any pathology depends upon the number of antibodies. In other words, the more antibodies, the nearer immunity. To many operators this is sufficient proof that a patient needs special preparation previous to, and special care after operation. Others claim an operation will correct the pathology and nature will regain *itself* without any external assistance. This being disputed ground, a free discussion may clear up the field.

Operations are classed as emergency and nonemergency. As a tonsillectomy is a nonemergency operation, it is not imperative to operate at a moment's notice. Many operations are done when it is most convenient for the physician or patient. The tonsil-adenoid operation can be put in this class, because farmers and workmen generally will select a day when it will be most convenient, and when they will lose the least time from their daily work. To accommodate the family—and perhaps to insure the operation—the surgeon will operate even when his judgment tells him a week later would yield better results.

Most of the tonsil-adenoid cases are anemic, and are suffering with some infection. Many of these cases—even though they are not hemophilic—are easy bleeders. Such cases take an anesthetic badly, yet rhinologists will take chances even when they know that previous preparation of the patient would obviate most dangers.

Who has the most deaths, the careful and conservative operator or the over-enthusiastic and the much-operative surgeon? The first thinks of quality, of doing good work, and of taking pleasure in his scientific achievements. The second thinks of

quantity, of doing as many operations as possible, and, perhaps, of the commercial side of the question. It has been said the careful and conservative rhinologist has no deaths, no infections, no pharyngeal abscesses, following operations; nor retarded recoveries due to general bacteriemia or psychologic backwardness. His successes and good results are attributed to preparation previous to and special care following tonsil-adenoid operations.

To keep their mortality rate low, some surgeons will operate only upon selected cases. In preparing their cases for the necessary operations, if the resistive power of the patient does not come up to the surgeon's standard he will not operate. If Bassedow, abdominal, or any cases with low vitality, can be improved by treatment and relaxation, then nonemergency, as tonsil-adenoid cases, can be made safer by previous preparation.

Because many tonsillectomies have been done successfully with no preparation of the patient, this is no argument against preparedness. The pathology of the case should indicate the extent of preparation before operation. I generally carry out the following regimen:

1. Examination of patient.
2. The administration of calcium chlorid for two or three days previous to a tonsillectomy. My experience with calcium lactat has not been very satisfactory. If indicated, I prescribe bicarbonat of soda, or give horse serum.
3. Adults are operated with a local and children with a general anesthetic. Naturally, there are some exceptions to this. For a local anesthetic, novocain with epinephrin has served me best, and ether for a general.
4. If the tonsil-adenoid operation is for the removal of obstructions in the upper or lower pharynx, the results will be good with the preparation as given above.
5. If the tonsillectomy is to remove some point of infection, it will be necessary to differentiate between a tubercular and a streptococcus infection.
6. If general tuberculosis, a tonsillectomy is not as a rule indicated. The glands, pharynx and nose can be cleaned with a fifteen or twenty per cent solution of argyrol. The case should take the ordinary T. B. treatment in a sanitarium, and when he has reached a certain power of resistance the pharynx can be operated.
7. If the case in hand is a mild streptococcus infection, the ordinary preparation and operation will yield splendid results.
8. If the case is a streptococcus infection of long duration, there generally will be rise of temperature, low vitality and many complications. With such, an operation should be postponed until a positive diagnosis is made and the patient's resistance has been raised.

Many cases are pronounced tubercular unjustly, because they have a daily rise of temperature and have a low vitality. Without a knowledge of differential diagnosis, I concede that it is better in all such cases for the attending physicians to placard the "gate-post" with the "T. B. Red Flag," because all these cases, untreated and operated, probably will become tubercular. All cases of tuberculosis have the streptococcus infection; but all cases of the streptococcus infection do not have the tubercule bacillus. If my observations are correct, all T. B. cases were infected with streptococci and, uncorrected, became infected with tubercule bacilli. Patients infected with streptococcus will improve rapidly with rest, diet, proper hygiene and vaccines. Theoretically, an autogenous vaccine should be ideal; but being convenient and accessible I have used *mostly* the stock vaccines. The successful use of vaccines requires time and experience. This is especially true in my experience, because the longer and the more I use them the better they serve me and my patients as a therapeutic agent. Badly infected cases will do better with the vaccine used before and after tonsillectomy.

9. Tonsil-adenoid operations should be done in the early morning, when patients are at their best.

Some patients are hypersensitive, some are ignorant and others imagine they know when they do not. For this reason I give to each patient a slip of paper containing postoperative direction. It is a time saver and an exertion conserver.

To avoid cases of general bacteriemia, pharyngeal abscesses, enlarged cervical glands, otorrhea, sinuitis and mastoid inflammations, I have adopted the following regimen:

1. In tonsil-adenoid operations, do nothing with the nose or throat for 24 hours. The free flow of the sterile serum from the operative field will obviate any gargles or irrigations.

2. The patient should be taught how to normally blow the nose. Earache, cracking of the ears, noises in the ears, otorrhea or mastoid involvement is caused by infection that has been carried up the eustachian tubes by the improper blowing of the nose. All such involvements can be avoided. Children obtain their instruction from their mothers, who generally do not know how to normally blow the nose. In fact very few adults, let alone the children, know how to properly blow the nose. It is easy to understand the physiology of the nose and the mechanism of the hearing apparatus. Patients should understand that, under normal conditions, all discharges of the nose should be evaporated by the air as it passes through the nostrils; but under abnormal conditions, as following tonsil-adenoid operations, the nose should be kept clean and clear of all infectious material. This can only be done by blowing the nose, which should always be open (anteriorly) when blowing.

3. Quiescent for twenty-four hours after operation, the nose and throat need cleansing, depending upon the discharges from the nasopharynx. As there is no desirable gargle that will

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3. Quiescent for twenty-four hours after operation, the nose and throat need cleansing, depending upon the discharges from the nasopharynx. As there is no desirable gargle that will

kill bacteria and not injure the mucosa, solutions of salt and borax are efficient and inexpensive.

4. After the third day encourage the chewing of gum. The mechanical action of the tongue against the operative field will smooth off many desirable points; besides, it will overcome the muscular stiffness and soreness.

5. The patient should be encouraged in drinking water freely; the bowels should move daily and all the emunctories should be working full time.

6. Diet: The patient is given liquid food the first twenty-four hours. Semisolid food the second twenty-four hours, and thereafter food that will be indicated.

No one can apply a universal rule to human pathology; but the above preparation before, and care after tonsillectomy, has given me good results. It is generally easier to avoid than to correct complications.

DISCUSSION

DR. EMIL MAYER, New York: Owing to the absence of Dr. Bryant, Dr. Spohn has asked me to open the discussion. I shall be pleased to do so and would like to say in the first instance that the reference to "chewing gum," in my opinion, has no place in any scientific paper. I feel quite sure that such a reference would only cause ridicule, especially as we have medicaments that would increase the flow of saliva and keep the jaws moving, such as marshmallow, slippery elm, etc.

To show that this is not a mere fancy I recall that Sir St. Clair Thomson, while discussing a paper by Dr. Chevalier at the meeting of the A. M. A., stated that he should not wonder if the American child at the age of six months was not taught to chew gum. Of course, this was said in fun, but many a truth is hidden in jest.

I agree that every patient should be as well prepared as possible for operation, but it happens very frequently that patients are sent to specialists by their own physicians who have made every needful examination and are willing to hold themselves responsible for conditions aside from the ones for which they are to be operated upon.

I have no desire to be personal and yet in the course of a long and active life it has occurred to me frequently that certain statements are made in published papers that are not lived up to in actual practice. I have known, for instance, of men stating that their local anesthesias are always painless. They must have forgotten some of those where the patients' moans and screams indicated nothing suggestive of a painless operation.

A patient may be entirely well as far as his principal organs are concerned and yet be very much affected by the anesthetic. I have learned to look with a good deal of suspicion and to watch carefully those patients who are obese and pasty looking. These do not seem to react well after an ether narcosis. In one instance that I know, a patient remained very somnolent for two full days with a thin thready pulse, recovering fully, however, after that time.

While no one has a right to say that any operation is free from danger, my own reply to the relatives of patients about to be operated for these conditions is, that in a long series of years I either performed the operation myself or was responsible for it to the number of more than

five thousand without a single fatality; I have stopped counting and that is some years ago.

Dr. J. A. Pratt, Minneapolis, Minn.: Just a word. In the first place, if we want our coagulation point slow we give a course of gelatin feeding. We use the dessert gelatin on the market, eaten three times a day for a week or two. We teach our patients who have a discharge from the postnasal region to clean the nose first by hawking back and then blow the nose with both nostrils free. In the after treatment we leave the tonsil fossa alone for the first five days. After that we touch up any granulating points with silver. We do use eucalyptus oil and start right in with the patient using that in the nose. That is about our only treatment.

Dr. Seymour Oppenheimer, New York City: I want to endorse in the main what Dr. Spohn has said, but would like to go a little further in the preliminary preparation of the patient. I might proceed by saying that most tonsil and adenoid operations are done badly, and I say that, after having observed a great number of operators in our large clinics. No two men seem to have the same technic. A proper preliminary examination is necessary in all cases, whether the case be in our private practice or hospital service. In many hospitals they are admitted the same day without previous investigation and without any investigation of the underlying conditions, and are promptly operated, so that the preliminary care as practiced in our public institution is bad. I think it is important to select the time of operation, not alone with reference to the general underlying condition, but as well considering the local conditions present in the nose and throat. Particularly be cautious not to operate too closely following an acute infection. In the past winter we have had experience with influenza. We have operated individuals who still have present some latent infection, and after our operation we have been chagrined to have the patients run a temperature, giving considerable concern. As to the employment of calcium chlorid, I have not had the results Dr. Spohn refers to. Personally, I believe calcium salts in general have very little, if any, influence upon the coagulation time of the patient. I fed some fifty normal children with calcium chlorid, testing their blood at various intervals, and I did not find it had any influence on the bleeding or coagulation time. Two other things Dr. Spohn refers to. The preliminary examination of the urine and the preliminary examination of the blood. We all know many individuals who require tonsil and adenoid operations do show an albuminuria and this we should determine in advance of the operation. Blood examination is equally important. You will be astonished if you make a number of examinations routinely to find how many of these individuals have not only a delayed coagulation time but a very protracted bleeding time, which is more important than the coagulation time, because it is suggestive of a purpuric tendency.

Dr. T. E. Carmody, Denver, Colo.: One point I believe Dr. Spohn did not cover and that is the examination of the teeth. It is important to see whether they are clean, and they should be clean before tonsil operation. Besides that, in children who are going to take a general anesthetic, I have seen lately three cases of a crown of the temporary teeth in the bronchus. They were dislocated by a gag and aspirated into the bronchus. So they should be examined beforehand for loose teeth. Dr. Mayer spoke of the patients taking the anesthetic badly. Now my anesethetist gets mad if anybody speaks that way. He says the anesthetic is taken the way it is given. The doctor spoke about giving plenty of water. I have done that for a good many years and very frequently give soda water. Now we have acidosis in some of those cases, and my prac-

tice is to give soda irrigations within thirty-four hours after the anesthetic, and if you do this you will find the urine will be returned without acetome. My practice is to clean the throat after operation, but I irrigate with a hot boric acid solution which removes the clots. I have never seen an ear infection from this. As regards gargles, Dr. Spohn says he has never seen any good, and I think they never do. A gargle with hot soda solution is the best thing we possibly can use. Dr. Oppenheimer spoke about the bleeding and coagulation time. I believe the matter of bleeding time is very important. I have been doing this only lately.

Dr. M. Metzenbaum, Cleveland, Ohio: If in the preparation of a patient for a tonsil operation, it is admitted that a urinalysis should be made and a coagulation test also, I presume the time will come when we will go a little further and give a qualitative examination of the blood. If the patient has some form of leukemia, then the enlarged tonsils and cervical glands may be the first noticeable expression of a very serious disease. And I wish to report five cases of leukemia, three of which came through operation with fatal after results. One was a married woman living in this city. She went to Baltimore. Her tonsils were removed by a very prominent man, and shortly after the operation she had a large spleen which went on to a fatal result. The other was a boy of seven—tonsils and adenoids were removed, and in three months the child died of leukemia. The other was a girl of six who was operated, and in six months she died. Then I saw a child and for some reason or other the case was suspicious. The leukocytes showed thirty-six thousand and operation was refused. Somewhat later I saw a boy of nine or ten. For some reason I became suspicious and a blood count showed forty thousand with all the signs of leukemia. I wish to mention this, so that if we are going to make a complete examination we should examine the blood.

Dr. Hal Foster, Kansas City, Mo.: I think it is the general opinion of all of us that in a normal child with enlarged tonsils, there is not much danger from hemorrhage or anesthetic, but I think all children should have a complete physical examination. The children reported dead—it is reported status lymphaticus—we find are children who breathe hard—some of them have an enlarged thymus. It has been my habit to have them go to the hospital the evening before and have the urinary examination made, not allowing them to go home the next morning. Certainly a complete and thorough examination should be made. The older we get the more careful we are. I think a skilful man should anticipate accidents and not wait for them to occur. Dr. Jackson reported to us cases of thymus gland enlargement. And I find some of these children with large cervical glands have an enlarged thymus. Tonics improve them wonderfully with safety to yourself and great advantage to your patient. I do not think we should wait until the child is dead to avoid accidents. If we are careful we will not have accidents. Most everybody these days is taking out tonsils. Out where I live they all do it except the x-ray man; by and by it will be an exception to see a laryngologist doing tonsil work. Talking with some of the other men I find they are having the same trouble.

Dr. Spohn (closing discussion): As stated in my paper, some cases will get well without preparation, some need special preparation for recovery and others will die in spite of all the attention given them previous to and following operations.

There is no universal rule, but as previous preparations to operation cannot injure a patient, it is safe and sane to bring the resistive power of the patient to the highest point possible.

I regret that vaccines were not freely discussed. I am a firm believer

in the use of vaccines. I have had splendid results therefrom, but if I am wrong, and my cases would have recovered without the vaccines, I should know. If we can dispense with a therapeutic measure, it is far better for both the patient and the physician. The longer I use vaccines the better results I have; but whether any protein would be as good I do not know.

I enjoyed the discussion of Dr. Mayer, but very few can show such a record of good results as he can. I have never had any deaths, but I may meet my Waterloo in my next case.

The opposition to chewing gum may be well founded, from the standpoint of habit, but as a means to restore the patient after an operation to the normal use of the pharyngeal muscles, I know of nothing better. It matters not what the patient chews. It is the mechanical action of the chewing that does the work.

Any means that will raise the low power of the coagulation of the blood is desirable. The use of calcium, gelatin and horse serum are all good. I am largely guided by the advice and history given by the anesthetist and the family physician. It is certainly more comfortable to be on the safe side before operating.

Our text-books tell us not to operate upon cases that have the tonsils acutely inflamed. From the standpoint of infection, it would be better to operate; but there would be much more hemorrhage thereby, because the edematous tissue would not contract as ordinary tissue does. I have operated on about 25 cases in various forms of the acute stages with good results. Barring excessive hemorrhage, I can see no objection to operations upon acute tonsil cases.

DIFFICULTIES AND FAILURES IN THE SLUDER TONSIL OPERATION

WILLIAM D. BLACK, M. D.,
ST. LOUIS, MO.

Were it not a fact that a fair percentage of the laryngologist's work consists in tonsil enucleation, I would feel like apologizing for presenting a paper such as this one, as there is little real surgical science in it but a good many practical points.

The Sluder technic, having been fully described many times by Sluder and others, mentions particularly the application of the method in routine work, but fails to mention the reasons for difficulties and failures and their correction, except in a few instances. What is meant here by the Sluder method of tonsil enucleation are those points in the operation which the author brought out several years ago, and which I shall mention briefly: (1) the Sluder tonsillotome; (2) the jaw as a point of resistance; (3) forcing the tonsil through the ring with the aid of the index finger; (4) separating the tonsil from its bed. The author of the method lays down certain exact rules for the performance of the operation and if followed, in the main, these rules will yield excellent results.

Before taking up the subject as the title suggests, I will state that, in my opinion, after many years of tonsil enucleation by the Sluder method, I consider the operation the quickest, safest and most thorough of any yet devised. It is owing to criticism of the technic that I feel that a short paper upon the difficulties and failures, as I have found them, might be of some advantage to those who are less persistent or who lack initiative when abnormal cases present themselves for operation.

In an average of 100 cases, the tonsils can be enucleated successfully to the extent of 97 per cent. For the remaining 3 per cent, one less familiar with the technic might advocate the dissection method, but with operators who are thoroughly familiar with the technic even these tonsils can be removed satisfactorily. In the foregoing abnormal cases, I do not mean to say that the most skillful operator can remove the tonsil intact at the first attempt, since it frequently requires two or three efforts before the fossa is clean. The difficulties presented in some cases are due to four causes: (1) variations of the inferior maxilla and

its alveolar eminence; (2) the Sluder tonsillotome as found on the market; (3) abnormal tonsils when considered in the anatomic sense; (4) the operator lacking the proper skill in manipulating the instrument.

THE SLUDER TONSILLITOME

The original Sluder tonsillotome, in my experience, is the best, and no modification that I have seen has any particular advantage over it.

The reasons why modifications seem necessary for some, are that many operators have not the strength in their hands to do good work. This was made more difficult by the teaching of Sluder, who recommended a dull blade.

After my first few cases of enucleation, I decided that a dull-bladed tonsillotome was wrong, since it did not lessen hemorrhage enough to offset the advantage of a much keener edged instrument. I do not advocate a razor blade tonsillotome but rather a compromise between a very sharp edge and a dull one.

Another reason for difficulty in the operation from the standpoint of an imperfect instrument, is that most of the instruments on the market have a thick blade and are not ground thin enough at the knife-like end; as a result, greater force is necessary. Another minor consideration in regard to the tonsillotome is the sliding blade, which must be loose fitting; just tight enough to prevent the blade from sliding home of its own weight when held in a vertical position. I think many operators who have trouble in not having strength enough in their hands, could do much better work if the points mentioned in regard to the instrument were taken into consideration. The most frequent cause of failure is not getting the tonsil intact; and the point that Sluder so forcibly emphasizes is holding the handle almost at a right angle to the jaw, after bringing the tonsil upward and forward before pushing the blade home.

ANATOMIC DEFECTS IN THE ANGLE OF THE INFERIOR MAXILLA

The inferior maxilla is frequently the cause of imperfect results in tonsil operations, owing to anatomic deviations from the normal. The most difficult type of jaw for enucleation of the tonsil is the one in which the jaw has a small alveolar eminence or where it is altogether absent. These inferior maxillas are almost in a straight line with the neck. I do not know of any reason why the operation should present such difficulties except on acount of the alveolar eminence being smaller or absent.

This prevents the instrument from being held in a firm position, hence the difficulty of keeping it at the correct angle when pushing the tonsil through the ring. In order to overcome this, the tonsil must be dislocated much farther forward.

In jaws of the foregoing type with elongated tonsils, which are most difficult for a good enucleation, the tonsil should be dislocated more forward, and more horizontally, the teeth interfering with any outward movement. In adults, the large tonsillotome should be used because it will assure a more perfect result. It is in these cases that it is often necessary to make a second effort in order to get a perfect result.

To avoid a failure, I would advise that in cases where this type of jaw is recognized, palpation of the region of the alveolar eminence and peritonsillar tissue be made before operating. Another type of anatomic anomaly encountered, is an elongated styloid process of the temporal bone. This condition, while infrequent, does occur, and recently was a cause for failure in one of my cases.

Should the tonsil be difficult of dislocation with the instrument, it would be a good plan to discontinue the enucleation; and instead palpate the tonsil and peritonsillar region and finish the operation by dissection should the elongated styloid process be discovered.

DEFORMITY OF HARD PALATE

This condition is so rare that it is scarcely worth while mentioning, but the fact that I had this sort of case and presented it, after the enucleation of the tonsils, to the Ear, Nose and Throat section of the St. Louis Medical Society, proved that even here good results can be obtained, and is my reason for calling your attention to it. The difficulty in such cases is that the hard palate is apparently longer and lower than the normal, and this allows the soft palate to lie at a lower level.

ABNORMAL TONSILS WHEN CONSIDERED IN THE ANATOMIC SENSE. THE ELONGATED TONSIL

This class of tonsils mentioned previously in relation to the anomaly of the inferior maxilla, is frequently found with the normal jaw; and while not as difficult of removal as when found in the abnormal jaw, is much more difficult to remove than the average tonsil, owing to the fact that it is closely attached to the pillar, is flat and usually firmly imbedded. Failure here is usually caused by the operator using the small-sized instrument and because not enough force is used to dislocate the tonsil.

In using the small-sized instrument, especially in adults, one almost invariably finds that one has failed to get the lower pole, and this necessitates a second attempt, though this is easily executed.

THE INFILTRATED TONSIL

In these cases, which result usually from repeated attacks of tonsillar and peritonsillar inflammation, one of the main causes for failure is that many operators do not wait long enough after an acute attack for resolution to occur. I think six weeks should elapse before attempting the operation, and generally at that time the tonsils can easily be removed. Occasionally one encounters cases in which there has been many attacks of tonsillar and peritonsillar inflammation at frequent intervals. In such cases resolution does not occur; one is obliged at times to operate. In these cases, an enormous infiltrate, especially involving the anterior peritonsillar tissue, is found, which feels almost as hard as cartilage and occasionally contains some new fibrous tissue. These cases are by far the most difficult for the Sluder method, but despite obstacles, the operator can remove the tonsil successfully if he uses great force and slowly massages the tonsil through the fenestra with his thumb.

SUBMERGED TONSIL WITH THICK MUSCULAR PILLARS

This form of tonsil is often difficult to remove at the first attempt and is made especially so when operating under local anesthesia. Owing to the usually small-sized tonsil, to the dense adhesions and muscular pillars, much force is necessary to dislocate the tonsil. After dislocation, the tonsil should be fed through the fenestra slowly, by gentle pressure of the thumb instead of the index finger. The thumb yields greater pressure, and the whole tonsil can be pushed through while the handle of the instrument is firmly held.

ATROPHIED TONSIL

Here we find a small tonsil separated from the anterior pillar for quite a distance and also a short distance from the posterior pillar. These atrophied tonsils, which are often badly diseased, many operators class for the dissection method in preference to the Sluder technic, because of the danger of buttonholing the anterior pillar. These tonsils are just as easy to remove as any others, provided one uses a good deal of force, quickly applied so as to dislocate, and by holding the handle of the instrument firmly and nearly at a right angle; then by gentle,

constant pressure with the thumb or index finger, the blade is pushed home and the tonsil comes away with its capsule. There is one kind of tonsil I shall mention, the lobulated tonsil, although not frequent, in which, if the operator is not careful, the operation will result in failure. Failure here is due to the operator examining the enucleated tonsil instead of the tonsillar fossa. In this type of case, one finds that he gets an almost perfect tonsil except that a very small section is missing, and if the section is not removed, at least one-half or even one-third of the original mass is still in situ.

EXCAVATED OR WORM-EATEN TONSIL

This type is not difficult of removal if the edges of the tonsils are not very adherent, but in case they are firm and adherent, so that it is almost impossible to make out the line of attachment to the pillars, removal is difficult. This difficulty can be overcome by separating the adhesions of the anterior and posterior pillars, although I have very rarely found it necessary to dissect the pillars from the tonsil. I have (in a very few instances) removed a small section of the pillar in the foregoing cases, and I am sure this accident would not have occurred had I taken a little more time in doing the work.

There may be other difficulties in working with the Sluder instrument, but in the above paragraphs I present the results for comparison and discussion.

DISCUSSION

Dr. T. E. Carmody, Denver: I have been using the Sluder technic for a number of years. I don't use the molar eminence to force the tonsil through. I always use the index finger. I also saw Johnston use the thumb and I sometimes use that. In using the index finger you can use more of the plica than when using the molar eminence. You can draw the tonsil forward and not only get the edge of your pillar but the plica. Black says he does not use a dull blade. I have always used the dull blade except in my first few cases. He speaks of turning the instrument out at right angles to the jaw because you can always get the lower lobe, and if you will examine your tonsils after they are out you will find the lower lobe, as I have called attention to, has no capsule. It is also easy to force the rim of the instrument between the lower and middle lobe because there is often a fissure between them. You can also find one between the upper and middle lobe, which is frequent in the rabbit. You sometimes miss the upper lobe by using too small an instrument.

As Dr. Black says, we sometimes fall down after a great many years of experience. Dr. Black speaks of the elongated styloid process: I know nothing about it. I have never run against one. He also speaks of waiting long enough after an acute inflammation; that is the principle we should go on and it doesn't make any difference what method we use. In the case where we have an inflammation, it will take much longer in healing

and there is a possibility of spreading the infection from the second tonsil to the first tonsillar fossa, where the tonsil has been removed.

In taking them out too early, recovery is long delayed. The peritonsillar infiltrate which we have, and which may remain for some weeks, makes it very difficult to force the tonsil through. In the so-called worm tonsil you may have difficulty in forcing through the whole of it, because it is the so-called rotten tonsil where our technic is poor. It is because a certain amount of it is soft and has granulation tissue which you may leave behind. I have had very little difficulty since I have mastered the technic, but once in a while I fail. A thing I find of great value following tonsillectomy, no matter what methods you use, is blowing orthoform into the tonsil fossa after removal. It does away with pain and it seems to hurry resolution. In one case I had a membrane which looked like a diphtheritic membrane. In this case I gave ten thousand units of antitoxin. The report was negative for diphtheria, the next day.

Dr. Wm. S. Tomlin, Indianapolis, Ind.: I want to add just a word to this extensive discussion, from some personal experiences and observations. I wish first to call attention to the technic in cases where we have a more or less recent peritonsillar abscess or where by examination or palpation we feel sure there is a peritonsillar focus of infection. In those cases I find it highly advantageous to make a small incision through the plica and then, when your pressure is applied, mop up the tissues in order that you may not get an inspiration of this infectious discharge. The extra lymphoid tissue outside of the tonsil is not a myth. It not only grows at the base of the tonsil but you will find it inside the pillars and yet outside the capsule, and whether you have used the snare or the Sluder, it is a useful thing to inspect carefully and see that there is none of this tissue left. Remember that under that lymphoid tissue there has been a focus of infection and your patient will not get the results you expected. I have frequently observed that onlookers who are not favorably inclined to the Sluder are likely to criticise if you fail to remove the whole tonsil in one movement. At the same time, if you see this man operate with his snare, he not infrequently goes back with his snare to get another piece of his tonsil tissue and doesn't charge it up to the operation.

Another thing, there is on the market an exceedingly useful instrument, a sharp curved sponge holder. Remove your left tonsil first and with the sponge in this curved holder let it slip around the cheek and hold the sponge in that fossa and the assistant and the sponge are out of the way.

One point about the bleeding, we ran a series of cases with dissection and snare and modified Sluder, they were all done by students but under supervision. The bleeding was in favor of the Sluder and I think this was due to the fact that it took less time.

Dr. J. A. Stucky, Lexington, Ky.: Comparisons are odious. We have been comparing the Sluder operation with two or three others. It doesn't make any difference what method you use, the one thing I want to call attention to mentioned by the essayist is, do not remove your tonsils if your patient has one or more degrees of temperature. I have been taking tonsils out for 25 or 30 years. You are going to meet a "Waterloo" sometime, and one of the saddest things you will come up against will be a postoperative cellulitis without any cause except that there was a little localized inflammation in the tonsil at the time you operated, and your patient's temperature was one hundred. I make it a rule in my private practice and my clinical work, if the child has a temperature of one hundred, do not take the tonsil out until it subsides.

Dr. G. W. Spohn, Elkhart, Ind.: At every meeting of Oto-Laryngology there is a paper on "The Sluder Method."

At least 75 per cent of the laryngologists use some other method (not the Sluder) for the enucleation of tonsils. If the "Sluder method" is the desideratum sought, then it needs no boosting.

Briefly, the tonsil is a gland that can be shelled out the same as any other lymphatic gland. Separated from the pillars, it can be shelled out the same as a hickory nut is shelled out of the husks. The use of the Sluder instrument, or any other sharp-cutting instrument, will cause much hemorrhage.

Will the essayist answer whether he has more or less hemorrhage with the use of the suction apparatus?

The painting of the tonsil region after operation with a 25 per cent solution of the Tinct. of Iodin will act as a styptic and prevent infection.

Dr. Irving W. Voorhees, New York City: The last word will never be said concerning tonsils. About a week ago a general practitioner called on me and said he would be glad to have me do his tonsil work, but he did not want tonsillectomies. "I have charge of a number of industrial concerns," he said. "We have about seventeen thousand cases a year, and during the 'flu' epidemic last year we kept careful tab on all the cases having influenza which developed pneumonia afterwards. We found that in all cases of pneumonia following influenza the patients had had a complete tonsillectomy. We believe that tonsillectomy lessens the patient's resistance and the infection is more apt to reach the lung. Therefore, when we send you a case, do a simple tonsillotomy." I did not know what to say to him, because rhinologists are agreed upon complete enucleation of the tonsils and we have learned to believe that it is the only safe operation. Should we pay any attention to this general practitioner's observations or not?

In reference to technic, mine is similar to Dr. Black's and some of the other gentlemen here, that is, I push the tonsil through the ring with the index finger. You should have short finger nails or you may buttonhole the anterior pillar. In some cases there is almost a dead space at the superior pole of tonsil. Sometimes, with a little too much pressure there, you get the anterior pillar. Usually amputation of the anterior pillar is due to the Sluder ring being too large. We should first attempt to judge the size of the tonsil we are going to remove and use a ring somewhat smaller than the tonsil itself. If you are careful to put your tonsillotome across the mouth, get the tongue out of the way and use suction so you have a clean field, then it is possible to push the tonsil through the ring and strip it out with your finger. I prefer a dull blade. As to the disappointment on the following day in finding some of the tonsil still present, I think it is unfair to many operators to say that they have not done a good tonsil operation. Many of us have thought we had removed a tonsil but this lingual tonsil at the inferior pole has worked up in position to fill up the cavity made by the enucleation. I am not sure that we must necessarily take out the lymphoid tissue at the base of the tongue, since no actual "tonsillitis" can arise from an infection of this tissue. One ought to retract the pillars with a hook and inspect the tonsillar fossae thoroughly before returning the patient to his bed.

Dr. Sidney Israel, Houston, Texas: So far as the amount of blood lost is concerned, when compared with tonsillectomy by dissection, you will agree that it is greater than when the La Force, Beck or Sluder instrument is used. On the other hand, one thing I have experienced under local anesthesia, particularly, is that there is a certain amount of shrinkage from the astringent effects of the injection of novocain and adrenalin in

the lower pole of the tonsil; whether you call it tonsil, or lymph tissue, there is a good deal of shrinkage. I have noticed this tissue below the tonsil before the tonsil has been anesthetized and during the removal of the tonsil in capsule. The next day, or as soon as the shrinking of the tissues from the novocain and the adrenalin has disappeared, on examining the throat you notice a piece of lymph tissue in the base of the fossa when you thought you had removed it all. There, in my opinion, is one of the largest obstacles to overcome with any ring instrument and it has been therefore necessary in our work to make a special effort to remove that piece of lymphoid tissue at the base of the tongue, after the tonsil has been removed in order to have as clean and smooth an appearing fossa as possible.

Dr. H. V. Dutrow, Dayton, O.: No one, I believe, was more prejudiced against the Sluder method than I several years ago. I had used the combined method, namely, sharp dissection and snare, with a great deal of satisfaction. I think I tried out every new ring instrument that came on the market. I had the original Sluder instrument, but could not force it home with my thumb. I also used the Braun instrument, and one devised by Dr. Beck, and one by Drs. Vail and Lamb of Cincinnati. At the 1917 meeting of the American Medical Association, held at Chicago, I saw the Sluder instrument with the lever on the handle, which I felt would make up my deficiency in the use of the original Sluder instrument. I had Mueller send me the two sizes of this instrument, and I was able to use them with a great deal of satisfaction. I think it is like every other good thing, it has its limitations. I think it by far the best instrument on the market for children and young adults. There is considerable skill necessary in acquiring the technic to use this instrument.

In a great many cases we have peculiarities in the shape of the lower jaw and the shape and position of the tonsil and the manner in which it is held between the pillars. You have to find your alveolar eminence or some other prominent place to afford something to press against in order to cause the tonsil to evert and force it through the ring of the instrument. No matter how careful a man's technic with the snare may be, especially in children, he will now and then get out a section of the posterior pillar resulting in a deformed throat. With the Sluder instrument you do not get into the muscle fibres of the superior constrictor. You look into your fossæ and find that it is smooth and the fibres of the aponeurosis are intact. The snare will cut through everything that gets in the wire loop. Personally I think the day is coming, and that day is not far distant, when the snare will have a very limited place in tonsil surgery. It will be either the Sluder or sharp dissection entirely. If you cannot use the Sluder instrument, learn to operate with a knife or scissors, and possibly the snare in snaring off the inferior lobe.

Dr. E. M. Seydell, Wichita, Kan.: I wish to mention that piece of tonsil tissue, termed by some the lingual lobe, which is not removed by the Sluder instrument. We have frequently seen severe inflammations of this tissue, when it has been left, and we now excise the lingual lobe after removing the tonsil proper, a curved knife or scissor being used for this purpose. We found great danger in injuring the anterior pillar with a resulting adhesion to the tongue, where the snare alone was used for this part of the operation.

Dr. W. D. Black (closing discussion): I thank you gentlemen for the discussion, but do not believe I can answer all in the time allotted to me.

Dr. Carmody spoke about not utilizing the alveolar eminence at the inner angle of the jaw. I frequently do not use it myself, but I believe

those learning the operation should follow the steps laid down by Dr. Sluder, the author of the method. After one becomes proficient, he can then modify it to suit his own ideas. You cannot follow the Sluder technic and not use the eminence. In my technic, I often do not utilize the alveolar eminence after dislocating the tonsil. The instrument should be brought up at a right angle and held there.

Dr. Carmody spoke of not being able in a few instances to get out the whole tonsil with the Sluder instrument. Of course, there are some cases that are very difficult, as I mentioned in my paper, and other cases where there is some anatomic anomaly, such as a deformed hard palate or an elongated styloid process. In these cases, you cannot use the ring instrument but will have to resort to the scissors or your finger.

Now, there is one point I would like to bring before you and that is the position of the patient. Some have the head hanging over the table and some have the patient in a sitting posture. Of course, with such positions, it is almost impossible to do a good operation. In my work, I have the patient's head on a level with the body, with the chin extended a little. Another cause of failure is that the average table in the operating room is too high and too broad. Owing to the height of the table, one cannot get the correct position to enucleate the second tonsil satisfactorily. This can be obviated by changing to the opposite side of the table and work from there.

In gas anesthesia, there is necessity for great speed and I would not recommend it for the beginner. Ether is much better. Someone in the discussion said he had 100 per cent perfect results with a snare. This percentage to me is unbelievable, because even the best operators only claim 98 per cent, and I doubt very much whether these 98 per cent men use the snare method.

Of course, at some future time, we may be able to get 100 per cent perfect results. So far, we are close to it, but it will probably be some new technic or new instrument and at a time when we have no anatomic anomalies. I believe it would be a good idea for most snare operators to learn the Sluder technic thoroughly and when they fail to get the tonsil intact with a snare, to remove the small pieces with the Sluder tonsillotome. With this instrument there is no reason why one should not get out the smallest possible piece after he becomes proficient with its use.

Another gentleman in discussion spoke of the lymphoid tissue at the base of the tonsil as being the lower pole. Of course, this is not the lower pole. It is a separate structure, lymphoid in character, that grows from the side of the tongue, has no crypts and does not get infected, consequently it is not necessary to remove it unless it interferes from the mechanical standpoint or reflexly. Someone mentioned that they would not use a sharp-bladed instrument. I mentioned in my paper that I do not use a razor blade or a dull blade, but an intermediate blade, so to speak. We know that by using a sharp knife, the blood vessels are more apt to contract quickly and consequently there will be less hemorrhage. Even in using a sharp-bladed instrument with this method, I do not see any danger, as there is nothing of importance to cut, if the operation is done correctly. There is absolutely no danger of injuring the internal carotid artery with this method. I have never had to sew a pillar owing to severe hemorrhage, but I have had some brisk bleeding occasionally, which can usually be stopped by pressure or tonsil hemostats. Of course, should these fail, I would advise sewing the pillar.

I thank the gentlemen for such an extended discussion on my paper and hope that we will all receive some benefit from it.

THREE REFLEX SIGNS USEFUL IN EXAMINING THE EARS FOR DEAFNESS.

Otto J. Stein, M. D.
CHICAGO, ILL.

In the examination of individuals for the purpose of determining the presence of any remnant of hearing or of those who believe or wish others to believe there is no auditory functions remaining, the expert otologist must at times resort to chicanery in addition to his carefully carried out and customarily used tests in an effort to find the presence of audition.

In studying some of the cases, the result of accidents, for instance, where the question arises whether any remaining hearing exists, especially where one is not materially aided by the individual's responses, or in very young children with delayed development of hearing, and in children who have apparently lost all their hearing from illness or otherwise and who are too young, or mentally undeveloped to reply sufficiently to the usual tests, in such cases every conceivable expedient must be employed to bring about an accurate status of the subject's hearing ability.

Many of the tests employed for determining the presence of hearing are inaccurate and too often carried out in a careless or haphazard manner. The results of the usual methods of examination depend entirely upon the subject's acknowledgment or negation of hearing. If he is too feeble-minded or indifferent to the tests, the results are inaccurate. If he is hysteric or is a malingerer the conclusions drawn are likely to be inaccurate.

In order to reach an opinion that is not entirely influenced by the subject's will or lack of will, there should be methods devised that in selected cases ignore the subjective expression completely and in place of them observations should be made upon other forms of manifestation. The reflexes may, therefore, be studied with more serious consideration than before.

The first two of the following three reflex signs, as aids in detecting the presence of hearing, have received my attention for some years. The third and latter sign is included here because it has been recognized by others and mentioned by them in the literature and also because it is a reflex of similar character to the two I have frequently observed.

The three reflex tests are the

Auricular reflex
Pupillary reflex
Cochleopalpebral reflex.

The auricular reflex is concerned with the motions of the external ear or auricle when the ear is subjected to a sudden and sharp sound. The pupillary and cochleopalpebral reflexes are movements of the iris and eyelids, respectively, occurring on the side under examination. In the performance of any of these tests it is important that they are made without the knowledge of the subject under examination. It is in addition necessary that various precautions be taken to eliminate other sources of excitation that might contribute to an erroneous interpretation of the tests.

The best objects with which to make the tests are a shrill whistle or a bell with a spring hammer, but even a C-2 tuning fork has been used. The sound-emitting instrument used should be one giving forth a clear, sharp, loud penetrating sound. After being sounded it is held quickly opposite the auditory meatus of the side under investigation. But first the subject is faced to the side, with the opposite ear canal stopped and a blind placed beside the eye next to the ear under examination. When making the pupillary reflex test care should be taken to avoid extreme lighting conditions and variations in same. The patient's vision should be directed at a distance to avoid fixation changes of the pupil. Quiet should prevail and all suggestions of any nature that might excite psychic reflexes can easily be avoided.

In observing the auricular reflex a movement of the pinna, either as a whole or in part, takes place as soon as the sound strikes the ear. The muscles of the outer ear are very rudimentary in man, and consequently they are susceptible to only very slight movement ordinarily, but being accessories to the function of audition, as is well exemplified in the animal, they are keenly sensitive to all sounds and on stimulation will contract within the range of their ability. In some cases it is the superior muscle, called the attolens aurem, that perceptibly moves the ear upward, while in others the action of the anterior muscle or attrahens aurem is the stronger and the ear moves forward as well as upward, and more rarely does the posterior or retrahens muscle overact the others, but usually they act in unison, raising the auricle as a whole and thereby straightening out the flexible cartilaginous canal, permitting the sound to enter more readily. In addition to these three muscles there are six others that play a

minor rôle in the hearing ability of man, but nevertheless have an importance in this subject because of their focusing function. These six little muscles known as the tragicus, antitragicus, helicia, major and minor, transversus auris and obliquus auris pass from one part of the pinna to another as their names imply. By their contracting and relaxing they pick up every stray bit of sound floating about in the neighborhood of the ear and deflect it in a way so as to find ready passage down the auditory canal Their action is never so manifest in one with good ordinary hearing, although still manifestly present in many people, but when the ability to hear is strained to the utmost these accessory muscles assert themselves and they seize upon every bit of sound in an endeavor to accentuate it and in that way their reflex action is brought to light more noticeably in the defective hearer than in the normal. It is the stimulation of these nerves chiefly that results in the movements of the auricle. Just how the circuit is completed remains to be shown. My idea is that the sound stimulus is received within the ear by the auditory nerve filaments still functioning and then carried to the auditory nucleus. The approximation of the facial and vagus nerve nuclei is such that the stimulation is readily relayed by their motor fibers to the external muscles. The anastomosis of the remaining nerves that supply motion to the integument and the other and smaller ear muscles complete this amazing arrangement of nerve fibers that play such an important part in collecting sound waves and focusing the auditory tube for the greatest degree of sound conveyance.

The movements of the ear are but a part of the numerous changes affected by the muscles of facial expression. Take a child who has lost almost all of its hearing as the result of some disease like cerebro-spinal meningitis for instance, and sound a note that it still hears sharply next to its ear and notice the play of the various muscles of expression, including those of the auricle, in joyous manifestation of its recognition. The nerve supply of the ear constitutes an interesting network of anastomosis between six different nerves, chief of which is the facial nerve through its posterior auricular and temporal branches.

The normal pupillary reflexes consist of a contracting and dilating action of the respective fibers of the sphincter pupillae. Various forms of stimuli affect the pupil of the eye and among these is sound vibration. The reflex stimulation from sound affects the pupil similar to the associated movements of convergence, accommodation and squinting by causing a contraction of the pupil. This would indicate that the nerve fibers of the oculo-

motor nerve were the particular ones affected and it, furthermore indicates why the winking of the cochleopalpebral reflex takes place under similar stimulation. In carrying out these tests it is assumed that any existing irregularities or vagaries of the pupil and lids has been carefully anticipated, otherwise the results would be misleading. It is also necessary that careful attention be given to the details in making the tests for a neglect in some of the precautions will militate against a correct interpretation.

DISCUSSION

Dr. Harry Pollock, Chicago, Ill.: In our work of detecting malingerers in those whose hearing is almost gone, we naturally take these reflexes into consideration. In fact, all of us do that unconsciously. Dr. Stein did not go into the details for malingering, but one of the easiest tests that we always use is simply if the patient complains of deafness in one ear and it is only used in unilateral deafness—if you close up one ear and have them read with the good ear closed they will raise their voice. Now we have all noticed in children by striking a sharp bell or whistle, you will see the facial expression change immediately. We have children brought to us two or three years old whose parents state they cannot hear, and in those cases it is important to know whether there is an absence of hearing or a remnant of hearing left. Of course, in those cases of absolute deafness there is nothing to be done in restoring the hearing. If it is partial we always have hope of restoring some part of the hearing and that can be learned by striking a tuning fork or whistle or bell and immediately you will see the patient's expression change. Not only the ear will move slightly but all the muscles of expression, and in those cases we can always expect some improvement in hearing. We very often use a tuning fork on the vertex of the head to see whether the facial expression changes or not. Of course, this is a poor method of doing because they feel the vibration and it is very difficult to state whether there is hearing or not. But to see whether they hear positively you can strike the tuning fork and hold it close to the ear, closing their eyes or guarding the eyes by the hand and if there is any hearing left you can always detect it in the movement of the ear or the eye or the facial expression. If we observe these reflexes it will aid us greatly in the diagnosis and also the prognosis of the disease.

Dr. Jos. C. Beck, Chicago Ill.: We all know that the internal ear has two distinct parts, the auditory and the vestibular, and yet we recognize it as one continuous canal. We have a way of determining the function of the internal ear, at least as far as the vestibular part is concerned, by producing nystagmus. And I think we should use that test to determine whether there is any remnant of hearing. Another point especially in cases of congenital deafness or lack of an auricle, to determine whether there is any hearing, we can make use of the x-ray. The internal ear is one of the first structures to become ossified and you can see beautifully in x-ray pictures that a cochlea is present. If present there is some likelihood that there may be some hearing present also.

Dr. J. M. Ingersoll, Cleveland, Ohio: The question of rudimentary muscles of the ear has interested me for some time. If we observe the ears carefully, and the tests of Dr. Stein stimulate our observations, we will find in some people that rudimentary muscles still persist. I have three patients who actually prick up their ears and they do it with each ear

independently. You can see the ear move upward and forward. Cases of that kind simply show that these rudimentary muscles do persist and occasionally are quite active. Now, the observation of these reflexes is like the observation of other things. If we are accustomed to look for them we see them more quickly. We train our eye to catch the little movements and I regard this test as quite valuable. Of course, we all can move our ears somewhat. Most of us do so only when we move our scalp. The suggestion made by Dr. Beck I consider a valuable one. As he suggested, I am perhaps overenthusiastic about stereoscopic work, but I do consider radiographs very valuable. In the majority of cases, with good x-ray pictures, you can see the semicircular canals. In the pathologic cases, such as occlusion of the auditory canal, especially bony occlusion, it will show up very distinctly in a stereoscopic x-ray. The reason more of you do not use the stereoscope is because it is like going back to the microscope—you are out of practice—to get the full value of the stereoscopic x-ray we must study them and learn to interpret them, and the information we get is worth while, particularly in doubtful cases.

A MEMBER: I would like to ask a question in regard to the x-ray in children. Is it possible to demonstrate the presence or absence of hearing by the x-ray? Another thing, how early in life is the nystagnus test available and what method should be used in carrying it out on children, and do the results in children tally with the results in adults?

DR. H. C. BALLENGER, Chicago, Ill.: I have had the privilege in the past year of being on the staff of a U. S. Public Health Service Hospital where we examined all the returned soldiers who are claimants for insurance due to deafness. Some of them apparently simulate deafness. In addition to the usual tests of hearing, we use the Barany noise apparatus. We place it first in the good ear and very casually ask them if they hear it distinctly in the good ear. I think 90 per cent of the patients claiming to be totally deaf in the opposite ear will answer. Place it in the bad ear and many do not answer. But if they do not hear your voice with the Barany apparatus in the good ear we ask them to read, as Dr. Pollock has suggested. If there is any question beyond that we refer to the plugged stethoscope. I believe Dr. Stein's tests would be a great addition to these tests I have mentioned.

DR. ROBERT SONNENSCHEIN, Chicago, Ill.: Dr. Stein's calling attention to these tests was very important, but I believe that adults who are intent upon claiming that they have unilateral deafness oftentimes are so well practiced that no movement of facial muscles can be detected. Now there is a test devised by Prof. Strenger of Koenigsberg years ago for unmasking simulated unilateral deafness, which we employed before the medical advisory board. We take two tuning forks of exactly the same pitch, such as Bezold's small a' (435 double vibration) or any two forks of the middle octaves of long duration of vibration; and blindfold the patient so that he does not know that two forks are being used. Ordinarily if the tuning fork is placed four inches from one ear and the other fork say 2 inches from the opposite ear, the sound will only be heard in the latter ear, because it drowns the sound heard in the other ear. If the patient, for instance, pretends to be deaf in the left ear, blindfold him before placing the tuning fork four inches from the left ear and he will deny hearing it. If you then hold the other fork close to the right ear he will say he hears it there. If you then place one fork four inches from the right, supposedly good ear, and the other fork only two inches from the left ear which is claimed to be deaf, the simulator says he hears nothing at all. The reason is that the fork nearer to the left ear drowns the sound from the one held four inches from the right ear so that the patient

does not know it is sounding there. He only hears the fork heard close to the left ear, but since he is simulating he says he hears nothing in that ear. If he really were deaf in the left ear he would at least hear four inches from the right or good ear.

Dr. Stein (closing discussion): Gentlemen, you will notice that the trend of the discussion, like most all discussions, goes off on other subjects. Very few of the gentlemen have discussed the paper, although their discussion is very illuminating. Dr. Pollock says all of us use the tests I mention without knowing it; therefore their value is lost to the observer. To obscure the effect of the tests and understand their meaning gives them the value they merit. There is one thing I would like to call attention to. Most all of you describe tests which depend upon the patient's or subject's interpretation. The tests that I have described are all objective interpretation, or observations made by the examiner without the subject's knowledge or aid. In a court of law, sometimes called justice, you will notice that if you are asked to testify in regard to a patient's hearing the court will not allow you to testify as to what the patient interprets regarding his hearing. The court will say, "Can you tell from your powers of observation whether this patient hears?" Unless you are familiar with these tests you will say, "No." You can say that you have turned the patient in a chair or douched his ears with water or shot galvanism into his ears and from the results obtained from such tests it is possible that he hears. But if you say that by the use of the tests I have just described to you and without consulting the patient whatsoever you can tell that he has some hearing, then your testimony as an expert will be admitted as evidence and will carry weight with the judge and the jury. Any testimony the patient himself gives relative to his hearing is of no value at all in a court of law, so that in this class of cases these tests are of particular value. In the malingerer it is very difficult ordinarily to detect whether there is hearing or not, but the tests even here have their value. I had the opportunity of examining quite a number of men for army service and I used these tests with a great deal of advantage. I have used them many years and feel that by watching carefully for these various reflex movements, they will help you quicker than what the patient himself tells you. In young children you can not use a vibrating fork placed against the head because they will misinterpret the sensation of feeling for that of sound. In those cases having only a remnant of hearing you must use air conduction as the medium of conveying the sound. It is wonderful to see, in the examination of such children and in the unsuspecting, how nicely these muscles come into play. Dr. Beck, if I understood him correctly, spoke about the value of nystagmus and the use of the x-ray for determining the presence of the functions of the semicircular canals. That is all very true, but it has nothing to do with the subject as discussed by me in my paper. I am more than glad to hear that Dr. Ingersoll has used these powers of observation successfully. I am sorry nothing was said of the eye reflexes by some of our ophthalmologists. Dr. Ballenger's remarks were also entirely taken up with the patient's response to tests, as were also those of Dr. Sonnenschein, but they too have nothing to do with my paper.

OTOGENIC FACIAL PARALYSIS

IRVING WILSON VOORHEES, M.S., M.D.
NEW YORK CITY

Paralysis of the facial nerve which arises in the course of an ear disease or which is related directly or indirectly to auditory lesions is described as "otogenic." Most facial paralyses are of peripheral origin. Those of central origin occur chiefly through intracranial complications of otogenic diseases. We differentiate complete and incomplete facial paralysis. Incomplete paralysis is better spoken of as paresis. Facial paralysis may also be classified as inflammatory or traumatic. The inflammatory types arise in the course of acute or chronic middle ear infection associated at times with labyrinthine suppuration or suppuration in the internal auditory meatus which for the most part is attendant upon purulent meningitis. In some cases facial paralysis is in reality part and parcel of a neuritis of the seventh and eighth nerves. It may also occur in certain lymphomatous diseases such as leukemia, pseudoleukemia, chlorosis and lymphosarcoma.

Certain malignant tumors either of the brain or arising from the middle ear may cause facial paralysis among other symptoms. This is sepecially true of acousticus tumors, gliomata and angiosarcomata, in which normal tissue is replaced by connective tissue. Traumatic cases are caused either by a fracture of the base of the skull extending through the petrous bone, or by some surgical procedure along the course of the seventh nerve.

Temporal lobe abscess may also cause facial paralysis. Abscesses of the cerebellum, if situated near the middle line in the worm, produce facial paralysis by pressure upon the rhomboid fossa.

Pathology: At postmortem one frequently finds pus along and within the nerve sheath and even between the nerve bundles, especially in the region of the geniculate ganglion. In many cases the nerve is surrounded by pus in the facial canal. In other cases the bony facial canal is destroyed either traumatically or by a chronic osteitis. Finally, after destruction of the bony wall, granulations or masses of cholesteatoma cause pressure upon the nerve, resulting in paralysis. Hemorrhage may also occur between the bony canal and the nerve sheath, but if the blood does

not penetrate into the nerve tissue itself, there is little interference with the function of the facial nerve.

Postoperative facial paralysis, if it occurs immediately after the operation, is the result of extensive bleeding into the nerve caused by the chiselling, or of an operative injury of the bony canal resulting in injury of the nerve or complete destruction of it.

Postoperative paralyses, which come on from three to six days after operation and develop gradually, are usually caused by direct infection during the operation setting up an acute neuritis of the seventh nerve, which disappears in a few days or weeks.

The peripheral facial fibres show a high tendency to regenerate. Return to normal is facilitated if the suppurative inflammation in the middle ear and in the nerve sheath is cured. Even in cases of long standing, the outlook for regeneration of the fibres is favorable if the cause is removed.

The most striking symptom of unilateral facial paralysis is a relaxation of the facial muscles on the paralyzed side and a contraction of the muscles on the sound side, bringing about a very unpleasant facial expression.

Through paralysis of the branch supplying the mouth the angle of the mouth is motionless, the skin of the cheek lacks its normal tension, is relaxed and sunken in, or puffs out during respiration. Paralysis of the frontal branch is followed by loss of voluntary movement of the skin of the forehead. Through paresis of the muscles which close the eyelids, there is more or less lagophthalmus, which in recent cases, is associated with increased tearing. Sometimes, especially in children, the tearing ceases and the surface of the bulb becomes dry. Insufficient closure or lack of closure of the lid leads to ulceration of the cornea. In rare cases, an iridocyclitis or panophthalmia may take place. In long standing facial paralyses, which began in early childhood, there is asymmetry of the skull so that on the diseased side the bony skull is poorly developed. If, in a peripheral facial paralysis all branches of the parotid plexus are concerned, then the site of the lesion is in the trunk of the nerve central to the parotid plexus. If the nerve is affected above the origin of the auriculo-temporal nerve and below the chorda tympani, then there exists not only paralysis of the facial musculature, but diminished mobility of the head and neck. If the chorda tympani is also concerned, then there are disturbances of taste and sometimes in the beginning of the paralysis, considerable burning in the affected

half of the tongue. Paralysis of the nerve to the stapedius muscles produces bad hearing and subjective noises. If the site of the lesion is in the internal auditory meatus, then there is a disturbance of function in the superficial petrosal nerve. Paralysis of one-half the palate is seen only in exceptional cases.

In central paralysis of the facial, there is never a complete unilateral degeneration of the peripheral distribution of the nerve. Some fibres still function as a rule. Chewing and drinking are difficult. Particles of food collect between the cheek and the teeth, and it is impossible to prevent fluids from running from the paralyzed side of the mouth when swallowing, but the patient very soon learns to overcome this disability, using the finger to press the food toward the sound side, and, when drinking, inclines his head always towards the sound side. At first, whistling and sucking are impossible.

Inflammatory otogenic facial paralyses are usually of infectious origin, and are rarely sudden. Usually this form of paralysis sets in with trifling disturbances in the face: that is involuntary twitching, transitory disturbances in the mouth or eye, and after a few days, sometimes after one or two weeks, reach their full development.

Diagnosis. In the majority of cases the otogenic character of the facial paralysis is to be determined from the history. This holds true especially for those lesions which take place in the course of acute or chronic middle ear suppuration, but if there is no such history, and if the drum membrane is intact, then it is difficult to differentiate between an otogenic paralysis and one of so-called "rheumatic" origin. The most important point is whether the paralysis developed quickly or slowly. Slow onset speaks for otogenic and rapid onset for "rheumatic" paralysis, barring, of course, the traumatic type.

Central paralysis is also to be recognized if either the upper or lower facial branches are involved, and by the fact that a complete unilateral paralysis never takes place. Finally, in peripheral facial paralyses, the electrical excitability of the peripheral nerves is pathologically changed, but in central paralysis this may be almost normal.

Prognosis. The extent of facial paralysis has no special prognostic significance. In general, it may be said that incomplete paralyses are more favorable than complete, but in otogenic facial paralyses, this is by no means the rule. More important is the rapidity with which the paralysis has arisen. For instance, there are postoperative paralyses which are completed immediately.

These are unfavorable cases. The longer the time which elapses from the beginning to the completely developed paralysis, the more favorable is the case. An opinion regarding the prognosis in peripheral paralyses is made possible by the electric test. Cases with retained faradic excitability often show quick and complete healing in from three to six weeks. It is seldom that a facial nerve lesion remains unhealed in the presence of retained faradic excitability.

Paralyses with loss of faradic excitability, whether they are partial or complete, are always to be looked upon as unfavorable. Favorable cases show the galvanic reaction increasing in degree during two or three week's observation. In these types, less and less current is required at each examination to produce muscular contraction. Unfavorable are those cases in which the electric reaction shows gradually decreasing excitability of the muscles. Also unfavorable are those in which only a trace of the electric reaction is present, and the galvanic excitability, especially on the mouth and eyelids, is reduced to a minimum.

The time necessary for complete restoration is difficult to determine beforehand. Severe paralysis and loss of faradic excitability usually require from six to eighteen months, but diminished or incomplete function upon the diseased side in these cases may remain for a long time, even for several years. The function of the facial nerve may not be restored at all, but even then a certain equilibrium is established, and the third nerve of the diseased side or the trigeminus of the sound side compensate for the most annoying disturbances, such as the taking of food and speaking. The remaining uncured cases may be divided into two groups: First, paralyses which persist in the form of marked muscular atony. These are exaggerated in degree by atrophy of the skin of the face and atrophy of the fat in the cheek. Second, paralyses which gradually show marked muscular contraction. Moderate contractures are favorable to a fair cosmetic effect. The normal profile is again seen, and the closure of the lid is better. But, if the contractures increase, there is then a high degree of disturbance, drawing of the angle of the mouth and permanent passive closure of the lid.

Treatment. As an aid to preventing the wounding of the facial nerve during mastoid operations, Dr. Charles E. Perkins has set down certain postulates which are of value to the operator.*

*C. E. Perkins. Facial Contractions During the Radical Mastoid Operation. Annals of Otol., Rhin. & Laryng. September, 1915, p. 664.

1. If the nerve is completely severed there will be one, and only one, contraction, which will involve all the muscles supplied by the facial. The anesthetist will be able to see that both the muscles at the angle of the mouth and those around the eye are involved. The paralysis will be permanent.

2. In the second type of case the nerve is injured by the instruments of the surgeon, but not completely severed. The tympanic wall of the fallopian canal is easily removed with the curette. Warning of such accident is frequently given by facial twitches. There is a partial paralysis which rapidly becomes complete.

3. This is a type where the nerve is bared, occurring usually in the horizontal part of its course, either as a developmental anomaly or because the bone over the nerve has been destroyed by bony degeneration. Twitching may occur from probing or from the pressure of a gauze sponge in the middle ear.

4. Twitching is caused by traction on the chorda tympani.

If the facial paralysis was caused by chronic middle ear suppuration, a radical mastoid operation should be immediately carried out. In these cases facial paralysis is a bad omen. It indicates that as a result of suppurative osteitis or of a gradually increasing or acute suppurative cholesteatoma, the labyrinth and the endocranium are in danger. Therefore, we must investigate every case of facial paralysis occurring in the course of a chronic middle ear suppuration very carefully in order to determine the possibility of a labyrinthitis or intracranial complication.

Slight facial paralysis with retained faradic excitability, occurring in the course of acute middle ear suppurations, may be treated conservatively if it shows a completely normal course; that is, normal temperature, no pain, no mastoid symptoms, no sinking of the posterior superior canal wall, and a gradual decrease of these symptoms with increasing hearing. But in all other cases, immediate posterior drainage should be undertaken.

If the paralysis has come on after operation, one should immediately change the dressing and look for splinters of bone in the facial canal, or for insufficient drainage of the middle ear. In such a case, the retroauricular wound should be kept open.

I once did a radical mastoid operation and followed the common practice of inviting the House Surgeon who assisted me to carry out the postoperative dressing and return the patient to the Ward. On the following day when I visited the Hospital, the patient showed a marked facial paralysis, for the explanation of which there seemed nothing tangible since the greatest care had

been exercised in watching the face throughout the operation. Upon removing the dressing, we found that the middle ear had been very firmly packed with gauze, thereby infringing in some way upon the integrity of the facial nerve. It was almost one year before this paralysis cleared up, but the intervening months were filled with many unpleasant moments on the part both of the patient and the operator.

When the facial paralysis occurs concomitant with suppurative labyrinthitis, exenteration of the labyrinth and exposure of the inner auditory meatus should be carried out. If there are, at the same time, symptoms of suppurative meningitis with postoperative paralysis, the most favorable results follow upon opening the facial canal in the middle ear. In traumatic paralyses resulting from wounds or complete division of the nerve and of its bony canal, wide opening of the facial canal may produce a good result if one succeeds in removing all obstacles which have hindered union of the divided nerve ends. Sometimes one can chisel a bony gutter in which the divided nerve ends can be protected.

In mild cases one may use faradic electricity which should be applied daily from five to ten minutes. One should use the strongest current which the patient can bear. If the faradic excitability is gone, then one should use the galvanic current. If galvanic excitability is present, one electrode is applied to the trunk of the nerve below the pinna, and the other electrode to an indifferent point; e. g., hand, breast, neck, etc. One should also galvanize the paralyzed muscles to keep them from atrophying. This electrical treatment may be supplanted by massage of the facial muscles and also by exercises which the patient can carry out before the mirror.

In uncured cases of long standing, surgical treatment only is of avail. An attempt should be made to anastomose the facial with the spinal accessory or the hypoglossal nerves. Or, one may try, through plastic operations, to improve the cosmetic defect and to do away with most of the unpleasant disturbances. There are two methods of anastomosis which may be used.

First: Anastomosis between the facial nerve and the motor branch of the spinal accessory. A slightly curved incision, 4 or 5 centimeters in length is carried from the lower limit of the pinna to the posterior border of the sterno-cleido mastoid. The soft parts are dissected by blunt dissection until one feels the styloid process. Just behind this, one finds the trunk of the facial surrounded by a fairly thick sheath. This is exposed, and with small forceps the nerve is drawn outward until it is put on

the stretch. This, in order that one may sever it as high up in the facial canal as possible. The spinal accessory is now exposed and followed upwards to the point of origin of the branch to the deltoid muscle. End to end anastomosis is now performed; that is, the deltoid branch of the spinal accessory is cut through obliquely and the central cut end is united with the peripheral oblique end of the facial by two silk sutures. The use of silk sutures in nerve anastomoses has been recommended by Gluck because it produces a certain inflammatory reaction which is favorable to the quick union of the united nerve ends. If one prefer lateral anastomosis, then the motor branch of the spinal accessory is cut superficially, with the scissors and at the spot where the neurilemma is removed, a number of the exposed nerve fibres are laid bare and the end of the facial nerve is implanted and held by sutures as in the above method. A thin strip of gauze, isoform or iodoform, is carried through the lower angle of the wound and the skin is closed by metal clamps.

Second. Anastomosis between the facial nerve and the hypoglossal nerve. The incision extends from the inferior point of insertion of the pinna about 4 cm. long toward the hyoid bone. The facial trunk is exposed as in spinal accessory anastomosis. The nerve is now sought for either in the digastric triangle or in the so-called lingual triangle and either a lateral anastomosis after superficial cutting away of the hypoglossal may be made, or an end-to-end union after severing the hypoglossal.

A strip of gauze is introduced through the anterior angle of the wound, as far as the anastomosis region, and the skin wound is closed by metal clamps.

The indication for undertaking anastomosis is found in certain cases of facial paralysis if, owing to trauma in the facial canal or in the facial nerve itself, a cure by conservative treatment seems impossible. For example: in cases of fracture in which not merely the nerve is severed but a portion of the nerve has been destroyed and where the bony facial canal has suffered severe injury. Likewise, in cases of paralysis through nerve infection where a part of the nerve and of the bony canal is completely destroyed through chronic middle ear suppuration or cholesteatoma.

In all cases of facial paralyses the question of *when* is quite as important as the question *how*. In general, when there is loss of faradic excitability and decreasing galvanic excitability of the muscles. Negative excitability of the nerve is the indication for anastomosis, if after a trial of six months or a year the con-

servative treatment has brought about no favorable changes and no functional improvement. If the facial paralysis exists longer than two years, then we have no reason to expect any improvement from anastomosis. Within two years the nerve has usually completely degenerated throughout its entire length so that the annexation of a sound motor nerve is without result.

Postoperative Course. Since we perform a facial anastomosis only in complete peripheral paralyses, the severing of the paralyzed facial does not produce any symptoms. It will be found that the small remnant of retained function in the region of the eyelid or angle of the mouth is preserved after central division of the facial trunk. This fact proves that these remnants are not to be ascribed to the paralyzed facial. They are the result of vicarious contribution of function from branches of the motor trigeminus of the same side, or facial nerve of the sound side. If the results from anastomosis by the end to end method are good there is often a shoulder paralysis on the side of the operation when the spinal accessory nerve is used, and a unilateral tongue paralysis when the hypoglossal nerve is used. These paralytic disturbances disappear in from eight to twelve months. Sometimes, however, they remain permanently. In any event degeneration in the facial must not have advanced too far. In favorable cases the first sign of improvement takes place in from six to twelve months; rarely in a shorter time. Under regularly continued galvanization, the patients first notice spontaneous improvement in chewing and drinking. They finally learn to whistle and to suck. An ideal result is only exceptionally possible as regards the cosmetic appearance of the face. Involuntary play of the facial muscles takes place in cases of facial accessory anastomosis when the shoulder is moved, and in cases of facial-hypoglossal anastomosis simultaneous with movements of the tongue. Whether the "cured" patients ever show complete innervation of the facial again is questionable. Theoretically more is to be hoped for in facial-hypoglossal anastomoses because the cortical area of the hypoglossal is placed very near to the cortical area of the facial. On the contrary, the cortical area of the facial is fairly remote from that of the accessory, so that in facial-accessory anastomoses in spite of the cure of the face itself, permanent associated movements of the shoulder are to be expected.

Gersuny has attempted to correct the facial deformity by a plastic method applied to the muscles. He recommends a suture of silk or silver wire introduced from within the mouth to prevent contracture of the angle of the mouth. The suture remains

from four to six weeks and is said to work favorably in contractures of moderate severity.

In cases of chronic relaxed paralyses or high grade contractures in the region of the eyelids, a plastic operation is indicated. These operations are described in various text books dealing with the eye. It must be mentioned that high grade muscle contractures represent the worst form of permanent facial paralyses. In such cases regular galvanization of the muscles should be carried out continually for several years once or twice weekly, and should last for about ten minutes at each sitting. Massage, hot air baths and diaphoresis should be administered whenever indicated.

DISCUSSION

Dr. Harry Pollock, Chicago, Ill.: One class of cases which the doctor omitted to mention, we see very rarely and that is herpes oticus in which a very short time after the onset you get a complete facial paralysis. It is of the rheumatic type, an inflammation of the lenticular ganglion and it takes a great deal longer time for recovery than ordinary Bells' palsy. It comes on very suddenly. One case I remember, the patient was in our office in the morning and we could not make a diagnosis. There was some tinnitus and pain and within an hour afterwards he telephoned us he had a complete facial paralysis. I saw the man the other night and he still has a little drooping of the eyelid. The balance of his face is completely restored. This syndrome was first described by Hunt. The prognosis is good but the recovery slow.

Dr. W. H. Tuckerman, of Cleveland, Ohio: I saw two youngsters develop facial paralysis which came on gradually in the course of three or four days, in the city hospital. There was nothing in the ears. The only confirmation of the origin of it was the fact that the other youngsters in the family had had infantile paralysis and these youngsters were brought in for observation. This should be remembered in the discussion of facial paralysis coming on gradually.

Dr. G. W. Boot, Chicago: I wish to take exception to the statement that the man who doesn't have a facial paralysis doesn't do many mastoid operations. Such a statement should not emanate from this society. A man who knows his anatomy well is not apt to have facial paralysis resulting from his operations.

Dr. Herman Jarecky, New York: I would like to ask one question in reference to a case which I have unfortunately had. I have been very fortunate in having no cases of facial paralysis except one which I would like to ask about. This child, a boy ten years of age, was operated by a man, whom we all admire, a few years ago for an acute mastoid. This physician was at the front, two years ago, when I saw this boy up in the country, and was asked to operate. He had a recurrence of the mastoid trouble. The whole back part of the ear was covered with an abscess and on pressure there the pus practically squirted out of the canal. I cleaned up the whole condition with the tip removed and during the whole operation the child was thoroughly watched and there was no twitching from beginning to end. The child was put back to bed all right and in 24 hours facial paralysis developed very slowly. It was a difficult matter to handle the child, and the faradic reaction of the muscles was positive, but that is a little doubtful on account of the behavior of the child. I might

say when the child was operated on the first time, a Wassermann was made and the child had some orthopedic treatment. He was badly developed physically. I understood the Wassermann was negative.

Dr. Jos. C. Beck: I think this is a very important subject to discuss because I think everybody occasionally gets a facial paralysis with the best of care, which has nothing to do with the operation. There is a specimen in New York that shows that the facial nerve is in an abnormal position, far out to the external border of the semicircular canal and that fact saved an otologist damages in a law suit. If a thing like that exists it could cause facial paralysis in any operation. In reference to otitic facial paralysis I have reported several cases of anastomosis. The last time I reported fifteen cases of anastomosis for this trouble, of which only three are of any value. In those twelve failures I tested out the reaction to degeneration and they were not suitable cases, so that would answer the point Dr. Taylor made. No matter how long paralysis exists, you can sometimes get a result. It is not like the contraction of the eyelid in paralysis from central origin, but like in any hemiplegia, there is a secondary contraction of these muscles and that might mislead you in thinking the patient is getter better instead of worse. Another point is the very careful observation of the reaction of degeneration. The Germans call it "Wurm-reaction," and as long as that exists the prognosis is good. As to the question of immediate operation, for instance in the war surgery, where parts of the nerve are removed, you would better do an immediate operation while you are having the case for some other operation on the face. There have been several experiments made of using catgut as a conductor between the two ends of the nerve, but they have not been reported yet. As to the chorda tympani nerve, I would like to have the doctor tell where the branches of the chorda tympani go to the nerve. My recollection is it is a nerve of special sense. Dr. Grant of Denver adds the descendens noni and plants it in the distal end of the spinal accessory. Another thing, in doing these operations you can take off a good part of the facial canal at the mastoid tip and thus obtain a longer piece of facial nerve for anastomosis. Immobilizing the head in plaster cast two or three days secures better union. The sinusoidal current is valuable in that it acts deeply on the nerves and on the muscles for therapeutic purposes.

Dr. Voorhees (closing discussion): I want to thank all of you for this very kind discussion. I think we can truly say that a surgeon who has never had a facial paralysis has not done very many mastoid operations. In regard to Dr. Jarecky's case I cannot make a diagnosis. Perhaps if he waits around long enough the patient following out his peripatetic proclivities may walk in here and someone could make a diagnosis for him. In regard to what Dr. Beck said about scar tissue forming instead of nerve tissue, that prohibits return of function. I think he misunderstood me about the chorda tympani. I was quoting from Dr. Perkins. The sinusoidal current I am not familiar with, but think it would be very helpful. Dr. Pollock mentioned herpes oticus, which should have been included in the paper. I heard Dr. Hunt read his original paper before the New York Academy of Medicine on this important syndrome and it should always be kept in mind.

WOODY PHLEGMON WITH REPORT OF CASES

H. L. Pollock, M. D.
CHICAGO, ILL.

In 1896 Paul Reclus[1] described a new clinical pathologic condition heretofore unrecognized and designated by him as Phlegmon Ligneux. It is characterized by an infiltration of the tissues of the neck and overlying skin; board-like to the touch, very chronic in its course with sharply defined borders, painless and never accompanied by any signs or symptoms of an acute inflammatory process. He cited five cases which he had previously treated and gave the detail histories of each patient.

Following this report it was presented by various German authors under the title of Holz Phlegmon and by English writers as Woody Phlegmon.

In looking up the English literature, one is surprised by the small number of papers alluding to this subject. In searching the various standard text books on Surgery, I find it casually mentioned in Keen's Surgery[2], in Tillman's[3] and in General Surgery by Lexer and Bevan,[4] and in De Costa's Surgery[5] it is gone into quite extensively. While the occurrence of this disease is quite infrequent, it is of sufficient importance that all of us should familiarize ourselves with the diagnosis and treatment, and especially the differential diagnosis between this disease and several of the chronic conditions with which it might be conflicted.

Judging from the cases cited in the literature, it usually occurs in adolescence, more frequently in those who are undernourished, although it does occur in the young and robust. In fact Tichtner[6] of Leipsic describes several cases of a milder variety which affected children and young adults only.

The disease runs a very chronic course and usually affects the tissues of the neck, although it may occur anywhere in the body, several cases of Wood Phlegmon having occurred in the abdominal wall and some in the legs, and one of the cases which I have seen affected the lower leg and foot. We as otolaryngologists being interested only in the disease as occurs in the neck, I shall confine my discussion to this particular phase of the subject.

The first symptom which presents itself, is a swelling either at the angle of the jaw or in the submaxillary gland. The swell-

ing increases slowly; is not painful nor accompanied by any sign of an acute inflammation such as chills, fever or redness.

The gland at times remains swollen for quite a long period—sometimes as long as six or eight weeks and gradually the swelling which now becomes edematous, extends down the side of the neck, not stopping until it reaches the clavicle, and extends from the midline of the neck posteriorly until the trapezius is reached. As the swelling progresses, it becomes more firm and board-like in its consistency, hence the name Woody Phlegmon. The overlying skin becomes firmly attached to the subcutaneous tissues and assumes a dark reddish hue. At no time is there any great amount of pain, either spontaneous or upon deep pressure. On account of the firm attachment of the skin, subcutaneous tissue and muscles, there is a restriction of the various movements of the head simulating the restricted movements of a torticollis. There is also difficulty in deglutition and on this account, the patients emaciate quite rapidly. There is at times interference with respiration and frequently it is necessary to do a hurried tracheotomy on account of edema of the larynx. Reclus' second case which he reports succumbed in a very short time, to edema of the larynx. During the progress of the disease, which extends usually over a period of several months, small superficial skin abscesses occur, which may open spontaneously: even these may cause little or no pain. The contents of these abscesses are sometimes quite clear, but they are usually filled with turbid fluid.

The full development of this stage requires anywhere from 6 to 10 months. At the height of the disease, the entire (not always unilateral) side of the neck is hard as wood, and cannot be confounded with any other condition. The difficulty of the diagnosis of which I will speak later, is usually in the earlier stages, before this typical picture is presented. The disease terminates either in a gradual resolution and recovery or in death, either from edema of the larynx or by gradual exhaustion.

Etiology. The exact etiology is not yet clear, but most authorities agree that it is a very low grade infection, not of sufficient degree to cause a breaking down of the tissues, but merely causing an infiltration of the connective tissue and a secondary contraction of same, thus causing the peculiar, characteristic, hard, board-like swelling.

From the small abscesses and often direct from an incision into the mass, we are able to recover various pus organisms. Reclus, as well as others, recovered a diplococcus which oc-

casionally grew in small chains. In one of his cases Reclus isolated a diphtheroid bacillus, from which a vaccine was made, and employed with great success, the patient recovering in much shorter time than in the other cases.

However, no special bacteria have been recovered in all cases, so that we might isolate any particular one as being pathognomonic. Owing to the fact that the tonsils, teeth, gums and mouth harbor a great number of bacteria, the infection is supposed to originate somewhere in this region and is carried by the lymphatics to the neck, which we all know are well supplied by the lymphatic system. However, the bacteria are of such a low grade that they do not set up an active inflammation and cause deep seated abscesses, but as described before they cause rather an infiltration of the various structures of the neck which by secondary contraction bring about this woodlike swelling.

Pathology. If we examine a piece of this tissue microscopically what do we find? This depends somewhat upon the region from which the specimen is taken. If we obtain a section through the submaxillary gland we, of course, find evidences of a chronic inflammation which is shown by an increase of the connective tissue stroma, and an infiltration of leucocytes. Owing to the epithelial lining of the tubules, one must be careful not to mistake these epithelial cells, often cut at various angles, for a carcinoma. If we cut through the structures in the neck, there is a firm tissue which is very fibrous. Microscopically there is nothing seen, except an increase in the connective tissue. While this disease per se is not a malignant one, yet there are true cases of carcinoma or sarcoma of the larynx or pharynx in which this hard, board-like swelling occurs, somewhat obscuring the diagnosis. This condition presented itself in the first case which I will report.

The diagnosis when the disease is fully established is comparatively easy. The board-like feeling, absence of pain and temperature, the difficulty of active movements of the head and deep reddish purple discoloration of the skin can not be mistaken for anything else. In the earlier stages, the disease is often mistaken for malignancy, either carcinoma or sarcoma, but a careful microscopic examination must disclose the malignancy. Actinomycosis must also at times be differentiated, but a careful examination will disclose the ray fungus.

The prognosis is usually good. Tichtner reports that all his cases recovered. Judging from all the literature which I find including the following, Reclus, Krause,[7], Fichtner, Sick,[8] Long,[9]

Jenney,[10] Kusnetzoff,[11] Muhsam,[12] Merkle,[13] Powers,[14] Grant,[15] Worthington[16] and others, I should say, that 75 per cent. of the cases recover. The prognosis depends whether resolution occurs or whether the process continues and death ensues, either from edema of the larynx or from gradual exhaustion due to slow starvation on account of the interference with deglutition.

Treatment. Two things must be taken into consideration in the management of these cases. First, the strength of the individual must be kept up, by feeding, tonics, etc.; second, everything must be done to promote resolution. This consists in multiple incision all through the affected areas. Hot moist compresses, applied over the entire affected region, are also beneficial. Some have advised to attempt a dissection of the entire mass, but the best results have been obtained by multiple incision in various portions of the tumor.

Dr. Joseph C. Beck and I have had five cases, three of which recovered and two died. I will report the first and fifth cases, both of which were fatal.

CASE 1.—Mr. K., January, 1911. Comes complaining of difficulty in swallowing and speaking. Voice is muffled. Noticed also that during the past year a swelling has been present only on the right side, below the angle of the jaw. States his tonsils were sore four months ago, at which time he consulted a physician who made an incision into the tonsil without relief to his condition.

Examination: Nose negative; mouth, oropharynx and larynx negative; right ear shows evidence of scars from old healed out suppuration.

Below the angle of the right jaw there was a swelling about the size of a walnut, quite movable but not painful, running forwards and towards the submaxillary region.

Left ear negative; other physical examinations negative.

Although no history given, antiluetic diagnostic treatment was given (cypridol). The growth externally gradually increased, spreading along the side of the neck toward the hyoid bone in back into the scalenous region. Along with this the voice became very much thicker. The skin over the entire swelling appeared to take on the appearance of a dark red color and to the touch did not seem painful or fluctuating. Pharyngeal, laryngeal and base of the tongue examination still negative and in view of the fact that antiluetic treatments including x-ray gave no results, we decided to incise it at the point which was most significant of fluctuation. Following this, bleeding was profuse but no pus expressed. A culture was made from the blood without any growth. After inserting a drain, moist hot compresses were applied and patient was relieved from the thick feeling in the throat. A piece of the tissues was taken from the region of

the neck and subjected to microscopic examination. It showed nothing but round cell infiltration.

The subsequent course of the patient was swelling increased and greater induration, not only on the right side of the neck, but extending to the left.

About four weeks later patient suddenly developed a swelling within the larynx in the region of the epiglottis. Excised a piece and subjected same to microscopic examination which proved it to be adenocarcinoma. From that time on the patient grew gradually worse, so that shortly after a tracheotomy was necessary and while he ran the usual course of carcinoma of the larynx, it was complicated by a very unusual secondary involvement of the neck unlike that usually seen in carcinoma. That is, the Woody Phlegmon continued to the last. Patient kept getting worse and finally dies of exhaustion.

CASE 2.—On December 30, 1918. I received the following letter:

"I am referring a patient to you by the name of Mr. G. He expects to arrive at your hospital tomorrow morning, January 1, 1919. He has what I would say, a carcinoma of the neck. He has been operated on several times, has had some few x-ray treatments and several applications of radium, but without any results. The surgeons who have operated and used the x-ray have given him very little encouragement."

January 1st Mr. G. presented himself and the following history was obtained:

Age 59 years. Ever since he can remember has been troubled with scrofulous glands, which break down and suppurate, then heal spontaneously. About one year ago a dentist who was making a partial lower plate for him, tried to force same into position, when he heard something crack in his lower jaw on the left side. This caused some pain which persisted for several weeks. He never returned to the dentist on account of fear of having his jaw injured again. Six months ago noticed a swelling just below the angle of the left jaw. It was not painful or tender. He consulted a surgeon who pronounced it cancer and advised an immediate operation. This was done in August. Shortly after this a swelling appeared on the right side at the angle of the jaw, which ruptured spontaneously. This swelling has opened and closed several times, always discharging pus. About this time the swelling began to involve the entire left side of the neck, which became stiff and hard, but never painful, nor was there any fever. Has been treated by radium and x-ray a great deal.

Examination: Nose in normal condition. Is wearing a complete upper set of teeth. The incisors and canine teeth are present, but show evidence of pyorrhea. The teeth in the right half of the lower jaw present, but the cuspids and molars absent on left side. Tongue freely movable. Tonsils small, submerged, not degenerated. Slight infiltration of the floor of mouth on left side adherent to the deeper structures of the neck. There is a scar under the chin extending from the angle of the left jaw to

the same position on the right jaw. At the end of the incision on the right side is a fistula, which extends upwards to the jaw, from which a thick, clear mucoid secretion exudes, this probably being saliva. The entire left side of the neck from the jaw to the clavicle and from the midline of the neck to the trapezius muscle is hard, sharply outlined and resembles a board. There is no tenderness, except in the area of the fistula. He is robust and well nourished, neck is stiff and in attempting to move his head he must turn his body.

Larynx: Normal; x-ray shows a thickening of the inferior maxilla near the angle, probably an osteitis or periostitis. Blood examination, shows a plus Wasserman and practically normal differential count.

At the time of the removal of the gland, a portion was submitted to the laboratory and the following report returned: Mostly granulation tissue, no evidence of malignancy. I had a compliment fixation test made for tuberculosis, which was negative, as was also an Abderhalden test for carcinoma. I made a diagnosis of Woody Phlegmon and as he was unwilling to remain in the city, returned home with instructions to his family physician for treatment as outlined above. In four weeks he returned somewhat emaciated and having difficulty in swallowing.

I suggested to his physician that I believed the fistula, which was still annoying him, was due to the submaxillary gland and advised complete removal of same, and at the same time could obtain another specimen for microscopic diagnosis.

In February I removed the right submaxillary gland, and took a small piece of tissue from the region of the left submaxillary gland also. The wound healed rapidly and he left for home a few days later. The microscopic report showed, in one section a neurofibroma, in sections 2 and 3 only fibroma, consisting of connective tissue with considerable round cell infiltration.

May 1, 1919, I received the following from his physician:

"I wish to inform you, as a matter of record, that Mr. G. died April 22, 1919. The wound in his neck healed nicely. He was unable to eat solid food and finally could not take liquids. The trouble seemed to spread and involved the entire neck."

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DISCUSSION

DR. HAL FOSTER, Kansas City: I do not know that I can add very much to what the doctor has so correctly stated. I have never seen but one case of this kind and at that time I looked up literature on the subject and all I could find was in Keen's Surgery. Fletcher Ingalls, in his early book, mentions a case, and the other cases reported were from McKenzie, in his old book. It seems to me that the etiology must be correct and must be from the lymphatics and the glands of the neck. The case that I saw was a lady who had bad tonsils and pyorrhea. No doubt she had what we now call a focal infection. I did what Dr. Pollock says, except that I irrigated with 2 per cent bichlorid. The lady finally got well. For some days I thought tracheotomy would be necessary. If I did it again I would use 2 per cent Dakin solution.

I think we are under obligations to Dr. Pollock for calling attention to this subject. I have seen a few cases of infiltration of the neck so well described in McKenzie's old book of surgery. If you have not read it I would advise you to get it. There are many valuable suggestions in it. The recent books on laryngology do not mention the subject at all. Perhaps they will now when they see the value of this paper. Dr. Pollock's treatment speaks for itself and I certainly congratulate the doctor on the report of these cases.

DR. CARMODY, Denver, Colo.: I wish to thank Dr. Pollock for bringing this subject before us. It is very interesting and while we do not see very many of them we may at times come across them, especially in malignant diseases. Most cases I have seen, three in number, have been in malignant disease of the larynx and required trachotomy. I want to say a word along the line Dr. Pollock mentioned as to the confusion in the early stages. It may be confused with Ludwig's angina. It is very rapid in development, so you will not be in doubt very long. You have to do a trachotomy in the first 24 or 48 hours in Ludwig's angina or you won't have a patient. It also may be confused with actinomycosis. I have had two cases of this kind in which it was a question for some time whether it was actinomycosis or phlegmon.

DR. B. F. ANDREWS of Chicago: This paper is very interesting to me and it brings to mind a case I had some years ago while practicing in the Republic of Mexico. The joints of the jaw became fixed and the patient was unable to lift his chin. He could swallow at first but the disease was not recognized as woody phlegmon, but treatment was on general principles and he got along all right but died later of another disease. I am also reminded of the resemblance to what we knew there as Medusa foot —I wonder if there might not be some etiologic connection between this condition in the neck and Medusa foot.

DR. SIDNEY ISRAEL, Houston, Texas: I failed to hear the preliminary remarks of the doctor, but I would like to ask him this? In some of the literature woody or leathery phelgmon is taken as a symptom or complication of some phase of focal infection. I do not know whether Dr. Pollock is able to trace these infections to some spot or foci, but McCallum takes the view and seems to hold to the idea that this condition is a symptom following some focus of infection, and the reason we have this leathery appearance is that the infection has failed to break down, degenerate or liquify.

DR. IRVING W. VOORHEES, New York City: I would like to ask whether any attempt was made by the bacteriologist to differentiate between aerobic and anaerobic organisms? Perhaps this infection may be anaerobic in origin inasmuch as when these cases are opened up they seem to improve. It might be well to determine that fact in the next case.

Dr. Joseph C. Beck, Chicago: I do not care to discuss the paper exactly as I have read it and know about it, but some points are brought out in the discussion that I would like to speak of. One is the unknown cause of this disease. Unquestionably it is bacterial, it is a bacillary infection of the blood. I believe from the cases I have seen following gas bacillus infection in war surgery, where no fluctuation or breakdown occurred, that it is most probably a bacillary infection and that is where the investigation should begin. You find a great difficulty in the drainage of these parts. Try to find not only the original focus, but from the infiltration try to isolate the organism. Then as to incisions—I go further, I use deep incisions and canalization in all directions and, as Foster says, use Dakin solution and use the tubes known as the Carrel-Dakin treatment.

Dr. Emil Mayer, New York City: Early in the appearance of these conditions you are apt to look upon it as a possible peritonillar abscess. If you have seen it for a long time that confusion would not arise, but I recall one case Dr. Pollock's paper brings to mind. He started in early with this brawny swelling and thickness. Dr. Pollock speaks of incision. I think he will bear me out if he will add deep incision. Scarification, of course, is not to be thought of. In the case I have in mind I looked upon it as carbuncular in character and treated it as such. In other words, I made a deep incision, wrapped a wooden applicator with a thin layer of cotton and dipped in concentrated carbolic acid, inserted it in the deep incision with the result that the patient got along a great deal quicker than she would have without. I would not be at all surprised, now that Dr. Pollock has called attention to this condition, that we may be able to see more cases and the infection not go so far as these cases that have lasted so long a time.

Dr. Pollock (closing discussion): I wish to thank the gentlemen for discussing this paper. These cases are quite rare. I made cultures in the last patient but did not obtain an aerobic. This, of course, was complicated with an incision, but I made an incision and we got no growth from the blood. I stated in my paper that various organisms had been recovered. The most common is the staphylococcus. In one case a diphtheroid germ was taken from the neck. In the second case we made an incision and found what we though was a diphtheria germ. We made a vaccine and the patient got well quickly.

In regard to incisions, I take it for granted that these must be deep, multiple incisions all over. It may be that there is an anaerobic organism, as Voorhees suggested. I said it was due to the focal infection around the mouth, teeth and joints and carried by the lymphatics into the neck. There have been a great many animal experiments made and they are found to be a very low grade infection. In the first case the man had pyorrhea and he said that when his dentist pushed his plate down he heard something crack. He could have opened the gums and the infection probably passed through the opening in the gum and he had periostitis which was the beginning of the infection that went down into the neck. In regard to the treatment it is only a question of time of having recovery occur quickly by making these incisions deep down into the neck and use Carrel-Dakin solution and put on hot moist compresses which will aid resolution.

THE TREATMENT AF CICATRICIAL WEB STENOSIS OF THE LARYNX AND TRACHEA.

HENRY LOWNDES LYNAH, M. D.
NEW YORK CITY.

Cicatricial web stenosis of the larynx and trachea is one of the most frequent causes of the inability to permanently detubate and decannulate patients suffering from chronic laryngeal and tracheal stenosis following diphtheria. The diphtheric lesion, however, and the hyperplasia which follows are not the only causes of the formation of these cicatricial webs, for they frequently follow injuries to the larynx, endoscopic operations for the removal of laryngeal papilloma, and plastic operations on the larynx and trachea.

The web stenosis may be located in the upper portion of the larynx and involve the ventricular bands, and leave only a small lumen for respiration in the posterior portion between the arytenoid eminences. This may be termed a supraglottic web. On the other hand, the vocal cords may be the chief site of the web, and this not infrequently follows endolaryngeal operations for the removal of multiple papillomata. The writer has seen two postoperative papilloma cases develop marked anterior commissural webs involving the anterior third of the vocal cords, and making the cords very short and infantile. In both of these cases, however, there was a remarkably good voice; the web not interfering with the approximation of the shortened vocal cords. In both cases the anterior web was easily removed, and there was no recurrence after one year.

In other cases the web stenosis may be subglottic, or may be deeply located in the region of the cricoid cartilage, or may even be located at the tracheal fistula. The writer has encountered two tracheal fistula webs. One followed an attempted plastic operation on a trachea, and the other was probably due to the prolonged use of an oversize tracheal cannula producing anterior and posterior spur formation, with final fusing of the spurs in the formation of a web. Of the supraglottic webs, the writer has encountered three following laryngofissure operations, and has seen one subglottic web develop following laryngostomy with the fistula still open and after the laryngeal wound had dermatized.

The most frequent location, however, of these stenotic webs, is in the region of the cricoid cartilage well below the vocal cords. Some of these may be termed tracheal webs, for many of them involve the upper tracheal rings as well. These webs are frequently imperforate when of long duration, especially in chronic tracheal cannula cases, when tracheotomy has been performed in the attempt to dispense with the intubation tube in postdiphtheritic laryngeal stenosis. The writer can recall five instances of imperforate web stenosis in the region of the cricoid cartilage, which was the sole cause of the inability to permanently decannulate the patient. It is surprising to see the marked arytenoid motion with such complete stenosis above the cannula. These webs were incised tracheoscopically and bouginaged. Again, the web in this locality may have a very small lumen for laryngeal respiration, not sufficient for air to pass freely through the larynx, and render decannulation difficult. The small lumen of the web at times may present a dimpled appearance. They may be thick and pyramidal at the base attachment to the laryngeal wall, and extremely thin in the central portion. This in a measure accounts for the ease of incision and bouginage to keep the lumen open. So far no web even with the small milimeter lumen for laryngeal respiration has had any tendency to increase its diameter without divulsion by mechanical measures, and any attempted reeducation to laryngeal respiration with the tracheal cannula partially occluded has not proven successful in my hands. It is surprising to see in the cases with only one millimeter lumen for laryngeal respiration above the cannula, that the vocal cords are quite normal. These children also possess remarkably good voices, provided the cord is not fixed in a subglottic cicatrix. If such be the case the voice will immediately return as soon as the subglottic cicatrix is severed. Arytenoid motion is always good in these cases even when there is complete imperforate web stenosis allowing no air to enter the larynx. This free arytenoid motion has been noted frequently by the writer to occur on the introduction of the laryngeal spatula, and it is caused by the gagging and swallowing efforts due to the presence of the speculum. This motion is probably kept up constantly by the acts of deglutition.

In some of the cases the larynx is apparently fused together, and when the lumen of the tracheal cannula is temporarily closed by the finger of an assistant no opening into the larynx can be seen, but there is good arytenoid motion seen through the speculum.

On the introduction of a small bougie in some cases, the fused

cords can be gently separated, and a small dark spot can be seen just below the cords, which is the imperforate subglottic cicatrix. As soon as the web is severed, which in some instances may be accomplished very satisfactorily with a small bougie, the patient will utter a loud cry much to the surprise of himself, as well as the operator and bystanders. When the web is gradually bouginaged and the diameter of the lumen increased, these children will have good voices and be able to breathe through the larynx without the lumen of the tracheal cannula being closed. This is accomplished by using small undersize cannulae in every instance, and obviates the necessity of plugging a larger lumen cannula. Plugging the tracheal cannula for reeducation to mouth respiration does not prove satisfactory when a cicatricial web is the cause of the stenosis above the cannula. The lumen of the web does not increase its diameter, for very little air will pass through a milimeter lumen.

The treatment of cicatricial web stenosis is by endolaryngeal and retrograde bouginage, and by repeated applications of the galvanocautery. If the cricoid web stenosis is thick and of imperforate type, the web may be severed with a knife, the cutting edge being turned in the anterior direction. If the web is of the thin imperforate, or dimpled variety in its central portion, gentle pressure with a small bougie will open it in a satisfactory manner. The tip of the bougie should be always directed ventrically to avoid a false passage into the esophagus. As soon as the web is incised by the laryngeal knife or galvanocautery, a small intubation tube or soft rubber laryngeal tube should be introduced to keep the edges from fusing, or else the stenosis may recur in the line of incision. This is only necessary, however, when one is dealing with an imperforate web stenosis. When the web has a lumen of from one to two milimeters in diameter, it should be gradually dilated by bougies until the lumen is of sufficient size to admit the galvanocautery knife. Then the web is easily severed and further bouginage keeps the lumen well open. The thick pyramidal base attachment of the web is gradually reduced by repeated applications of the galvanocautery.

The lumen of a web has no tendency to close once bouginage has been started, and the diameter of the lumen usually remains the same size as the last bougie introduced. The lumen has no tendency to increase its diameter without mechanical divulsion from time to time. Bouginage and galvanocauterization are performed once a week.

In cases suffering from complete cicatricial web stenosis with fusing of the cords, bouginage performed with great care will open the larynx, and then the introduction of the writer's soft rubber laryngeal tube will keep the lumen open. Once the lumen has been opened after dilatation with the soft rubber tube, repeated applications of the cautery and continued bouginage are necessary to increase the diameter and reduce the thickened peripheral edges of the web.

The same method of treatment has been employed in the treatment of tracheal stenosis. Great care should always be taken when introducing a bougie into the tracheal fistula. The tip of the bougie should be directed ventrically and the anterior lip of the tracheal fistula raised. The tracheal fistula should be studied with a short tracheoscope before bouginage is attempted. By following out this method of introduction of the tip of the bougie and by gentle manipulation the bougie can be readily introduced. Spur formations, polypoid granulations and all fungating tissue in the tracheal fistula are removed by tracheal curretage after dilatation has been accomplished. With great care retrograde cauterization can be accomplished tracheoscopically in the same manner as when dealing with laryngeal webs.

Case 1. J. A. A young woman twenty-five years of age was referred by Dr. Archibald Dickson of the Willard Parker Hospital for treatment. On admission to the hospital the patient was breathing with much difficulty and there was a whistling sound audible at some distance, both on inspiration and expiration. The whistling respiration simulated tubal breathing through a small tracheal cannula. Her neck was examined, but no tracheotomy tube was present, and the whistling noise was produced by a stenotic laryngeal web which had only a very small lumen for respiration. The neck was a mass of scar tissue, a thyrotomy having been performed at the Manhattan Eye and Ear Infirmary at the age of five years for the relief of postdiphtheritic laryngeal stenosis and the retention of an intubation tube. The operation was successful after the wound had closed over the intubation tube, and the patient was able to remain without the tube, but never had a voice. How much dyspnea she had following the removal of the tube it is impossible to state definitely, for the old case histories of the Manhattan Eye and Ear Infirmary were not accessible.

An attempted laryngeal examination was made with a mirror, but as the patient was so dyspneic a satisfactory view was impossible. Low tracheotomy was performed under local novocain anesthesia and the larynx examined by direct inspection three days later.

There was a complete cicitricial stenotic web which stretched across the laryngeal aperture. (Fig. 1 A.) The vocal cords

were not visible, and there was only a small opening in the web between the arytenoid eminences for respiration.

The web was incised and the larynx bouginaged a few days later. After dilatation the author's soft rubber laryngeal tube was introduced to keep the lumen open. (Fig. 1. D.)

The patient is still under treatment. There is no motion of the arytenoid joints and no return of voice after the removal of the tube. However, the laryngeal lumen has increased in diameter.

Case 2. C. O. A boy of four years of age was admitted to Kingston Avenue Hospital for what was supposed to be laryngeal diphtheria. The child was isolated on admission by Dr. Raymond Laub, who called me to make a direct laryngeal examination, for there was a history of laryngeal papilloma having been removed at a hospital in Brooklyn two years before.

The boy while dyspneic had a fairly good voice. The

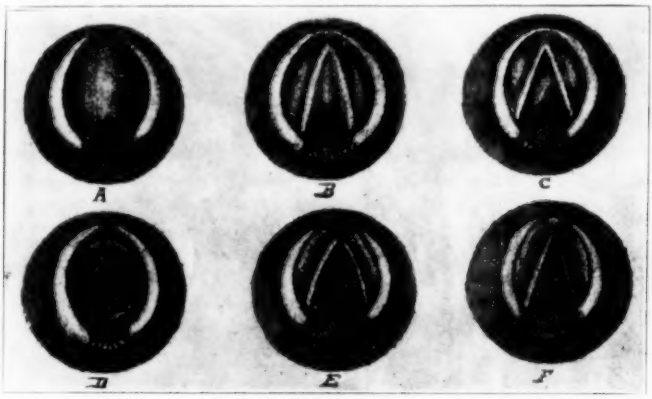

Fig. 1
Cicatricial Web Stenosis

dyspnea was both inspiratory and expiratory, but the greatest difficulty was with inspiration. There was an old tracheal scar in the neck.

The direct laryngeal examination revealed a vocal cord web, which involved the anterior two-thirds. (Fig. 1B.) The web was loose and was sucked in on inspiration. The child was able to cry, for there was good arytenoid motion, and the shortened vocal cords approximated to produce the voice. Tracheotomy was performed in the line of the old scar, great care being taken to locate the original opening into the trachea. The primary incision should always be opened when performing secondary tracheotomy, or else a sloughing cartilage island may be the result and cause difficult tracheal stenosis.

The web was gradually incised by galvanocauterization and the vocal cords lengthened. (Fig 1E.) The boy made a complete recovery, and there was no recurrence of the web after one year.

Case 3. Z. B. A girl of two and a half years was referred by Dr. S. J. Keefe of Elizabeth, N. J. The child had been intubated for laryngeal diphtheria by Dr. Keefe, and owing to persistent subglottic edema detubation was impossible. Dr. Keefe then performed tracheotomy and detubated the child. For two months the child breathed fairly well through the larynx, but it was impossible for her to breathe with the cannula occluded, or even with an undersize cannula. The child had a fairly good voice and was able to cry, but there was difficulty both with inspiration and expiration. After having worn a tracheal cannula for over one year, Dr. Keefe kindly referred her to the writer for treatment.

The larynx was in good condition, the vocal cords were normal, and there was good motion of the arytenoid cartilages. Below the cords was seen a cicatricial bulging which looked not unlike a marked subglottic edema bulging from the left lateral wall. (Fig. 1C.) A 5 mm. tracheoscope was introduced through the speculum to get a better view of the bulging in the subglottic region. The stenosis was now recognized as a dense cicatricial subglottic band or web partially obstructing the laryngeal lumen. The web was incised by the galvanocautery knife, and a short rubber intubation tube introduced to keep the lumen open. This tube was left in for one week, when it was removed and a second application of the cautery made. The treatment was continued at weekly intervals until the web had disappeared. The child was decannulated after six months' treatment and has remained well ever since. There has been no recurrence of the web or cicatricial band after a period of two years. (Fig. 1 F.)

Case 4. H. J. A child of two years was referred by Dr. Angelo Smith of Yonkers, N. Y., for decannulation. The child had been intubated by Dr. Roberto for laryngeal diphtheria, but as the child persistently coughed up the tube he called Dr. Smith, who performed tracheotomy. The child breathed fairly well through the larynx for the first month, but shortly after laryngeal respiration became difficult and no air would enter the larynx.

On direct inspection the vocal cords were apparently in good condition but reddened, there was good arytenoid motion even with no air passing through the larynx. This was caused by gagging due to the presence of the speculum. Deep down in the region of the cricoid cartilage could be seen a cicatricial web. With a 4 mm. tracheoscope the web was studied. The web was imperforate with a small dark spot in the central portion, which in closing had completely shut off all air from entering the larynx. The central closure was apparently thin and presented the appearance of a dimple. (Fig. 2A.)

With a small bougie the dark spot was opened and air immediately entered the larynx and the child was able to cry. The lumen was gradually increased in diameter by endoscopic bouginage until it was sufficiently opened to admit a 5 mm. soft rubber laryngeal tube. Then bouginage was started from below and the soft rubber laryngeal tube introduced. This treatment

has been continued for nine months, and at the present time there is no web present and the child is able to breathe well through the larynx with the lumen of the tracheal cannula open. A 4 mm. lumen cannula has been used, and the child has had no difficulty in breathing through the larynx since the laryngeal obstruction has been removed. (Fig. 2D.) The small undersize tracheal cannula gives much more room for air to pass freely by the cannula into the larynx.

Case 5. G. S. A boy of four and a half years was referred by Dr. Fred N. Sperry of New Haven, Conn., for decannulation. The boy had been admitted to the New Haven Hospital on October 22nd, 1918, for laryngeal diphtheria and intubated shortly thereafter. The tube was coughed up five days later and the boy remained without the tube and was discharged from the hospital ten days later. The boy had no difficulty in breathing on the day of his discharge from the hospital, but he returned three days later. The dyspnea now became gradually progressive and there was marked inspiratory and expiratory difficulty. Dr. H. S. Reynolds made a very thorough physical examination and found the heart and lungs negative. The respiratory sounds were equal on both sides of the chest, in spite of the marked

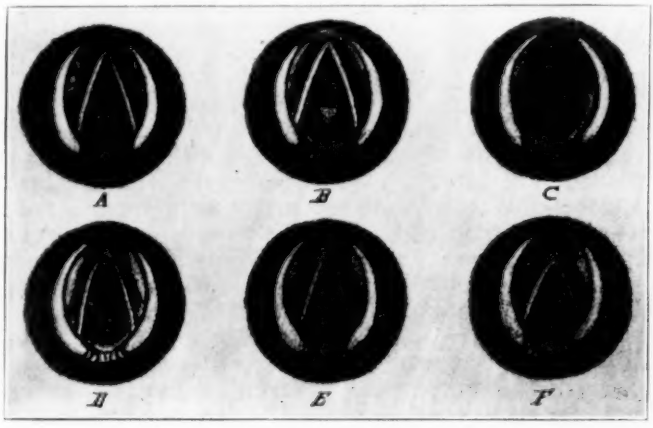

Fig. 2
Cicatricial Web Stenosis

retraction. Reintubation was not attempted and a low tracheotomy was performed by Dr. Sperry. The tracheal tube became dislodged two days later, and a longer tube was introduced. There was some reaction following the tracheotomy, but the temperature fell to normal a few days later. Attempts were made to plug the tube and make the child breathe through the larynx, but this was unsuccessful and the child would become cyanotic. Similar attempts with the tube removed were equally unsuccessful. A radiographic plate taken at this time showed no thymus enlargement. The foregoing is a brief abstract taken

from the case history of the patient while in the New Haven Hospital, which was kindly forwarded to the writer by Dr. Sperry.

On April 14, 1919, the boy was admitted to the Willard Parker Hospital. Cultures taken from the tracheal tube showed K. L. bacilli.

A direct laryngeal examination showed a good pair of vocal cords with a slightly shortened anterior commissure. There was good arytenoid motion. Deeply located below the cords in the region of the cricoid cartilage could be seen a cicatricial web with a small central lumen of about two milimeters in diameter. (Fig. 2B.) This web was further studied with a 5 mm. tracheoscope to get a closer view. The web was bouginaged and the lumen gradually increased. At first it was extremely difficult to insert the smallest bougie through the opening in the web, but after seven treatments an eighteen to twenty mm. bougie was readily introduced. There still remained, however, the thickened peripheral edges of the web, and these were gradually cauterized until they have disappeared. The laryngeal lumen is well open, and the boy can breathe normally through his larynx without the lumen of the tracheal cannula being closed. He has worn an undersize tracheal cannula since admission and has been reeducated to mouth respiration while the lumen is wide open. There is no dyspnea and the boy will be decannulated shortly. (Fig. 2E.)

Case 6. M. S. A boy of two and a half years of age was referred by Dr. Sperry for decannulation. The following is a brief abstract of the case history forwarded to the writer by Dr. Sperry. The patient was admitted to the New Haven Hospital October 6, 1918, with marked stridor and retraction and was immediately intubated. The boy was suffering from severe type of laryngeal diphtheria, having been ill five days prior to admission. A dose of 20.000 units of antitoxin was administered. A thorough physical examination was made by Dr. Tileston after the child was intubated. Aside from noisy respiration due to the presence of the tube, no bronchial obstruction or pulmonary involvement were elicited. The tube was coughed up on the fifth day and reintubation was necessary in one hour. There were now a series of extubations and autoextubations to November 11th, when the tube was coughed up as fast as it was replaced. On this day it was necessary to perform an emergency tracheotomy to save the life of the patient. A note by Dr. Denning says: The patient was practically dead after autoextubation of the tube. Emergency tracheotomy was performed and artificial respiration restored the patient. Since tracheotomy there has been no noteworthy change in the patient's condition. He has gained in weight and the temperature remains normal. Attempts at blocking the opening of the tube, or at plugging the wound when the tube is removed, result in the patient becoming much frightened and cyanotic. Removal of the tube without plugging the wound has the same effect."

On April 14th, 1919, the patient was admitted to the Willard Parker Hospital, as cultures from his tracheal tube also showed K. L. bacilli.

Direct laryngeal examination showed complete closure of the larynx with apparent fusing of the cords. (Fig. 2 C.) However, there was good arytenoid motion due to gagging on introduction of the speculum. With a small olive pointed bougie the fused cords were gently separated, but the bougie would not pass through the larynx. One week later a second attempt was made after the cords were separated, but this was also unsuccessful. The tip of the bougie would enter the larynx for about one centimeter. At this examination a dark area was noted below the separated cords, which was an imperforate web cicatrix. At the third trial one week later the small bougie passed through the

Fig. 3
Cicatricial Web Stenosis

larynx, and as the lumen opened the child uttered a loud cry. Bouginage was continued at weekly intervals until a 16 mm. size could be passed with ease. Then retrograde bouginage was started and the larynx and trachea were dilated. A 5 mm. soft rubber laryngeal tube was introduced to keep the lumen open and an undersize tracheal cannula introduced. The rubber laryngeal tube was worn for four weeks with a change once each week for cleansing and further bougie dilatations. After four weeks the soft rubber laryngeal tube was removed for a test for laryngeal respiration without the tube. The child was able to breathe fairly well through the larynx with the lumen of the undersize tracheal cannula open. He still continues to breathe

through his larynx and the cicatricial web has disappeared. However, the vocal cords are shortened anteriorly. (Fig. 2F.) He has not been decannulated, for he has just recovered from a severe attack of measles and broncho-pneumonia. These unfortunate crossed infections occurring at times in the writer's chronic larngeal cases have frequently put an end to what promised to be a successful outcome.

DISCUSSION

Dr. E. Mayer, New York City: I would like to ask in the first place of Dr. Lynah, when he makes these applications does he do it endolaryngoscopically or under suspension? (Dr. Lynah replied endolaryngoscopically.) These web formations are comparatively rare at the present time and yet they must have been quite frequent in the early days of laryngology. One of the best known laryngologists was Whistler and he devised a bougie in the interior of which there was a knife and with his mirror he looked into the larynx and then sprang the concealed knife and divided these webs. In my career I have seen but one of these webs which was divided, restoring the respiration. I would like to know furthermore whether the speaker has any experience as far as fulguration is concerned? In the dilatation of these stenoses, whether of web formation or of a tracheal character, one's patience is tried very much indeed. A year or two ago I reported a case of tracheal stenosis with treatment in a young boy who had to be anesthetized every time the intubation tube was taken out, cleaned and returned. I think he had in the course of several years treatment, something like forty different anesthesias. The interesting part was that with that long treatment of cleaning the tube and reinserting it at the end of each six weeks, it resulted in our being able to do away with the tube altogether and although the boy had lost quite a few of the tracheal rings, there was such firmness in the tissue in the side of the neck that they formed a new trachea for him and for more than a year he has been breathing without any tracheotomy tube. The work Dr. Lynah has done speaks for itself. He has unusual advantages at the Willard Parker Hospital, where he sees so many of these postdiphtheritic cases. At times the tube would have to be lengthened to quite a considerable size, compared to what it was before, and at other times it would have to be shortened. The exhibit on the screen would have been interesting, for you would carry away a perfect knowledge at the hands of one whom I consider to be a master of the subject.

Dr. Edward J. Bernstein: I do not wish to speak about postdiphtheric cicatrization, which I have seen very rarely, but want to say a word about cicatrization in the upper respiratory tract from the accidental swallowing of caustics. In almost every home one enters, one finds these caustic alkalies, Gold Dust Twins and Dutch Cleanser. These are all over, in everybody's home, and I think we should warn patients that these things are dangerous to be left around in reach of small children, and they should keep them in a safe place. Whenever I go into a family I tell them about the danger of inadvertent mixture with food, and to keep them away from the children.

Dr. Harry Pollock: I just recently had a case of cicatricial web of the larynx in a woman probably 35 years, who seven years previously had become hoarse and had some difficulty in her breathing. During that time she had been operated on and about three years ago was operated on the second time with the same result. She was brought to us and I found the cicatricial web extending about two-thirds from the anterior

commissure back. I worked on this under a local anesthetic and with my long cautery tip divided the web. One point I want to mention is the advantage of suspension laryngoscopy over bronchoscopic treatment. You have both hands free and can do very much better. When you get down into the trachea it is possibly a little bit different, but with the suspension apparatus you can introduce your tube directly through your suspension apparatus. In this particular case that I mention I gave the attending physicians instruction to pass bougies constantly down through this larynx to keep it from growing together again. I do not know how this web originated. It came on gradually with a little difficulty in breathing. We have several cicatrices from operative interference, but I don't think cutting will do any good. I think the best method is the cauterization method. Destroy the entire web and keep that dilated with bougies. This can be done under suspension and passing the bougies down so you can see what you are doing. Leave it in as long as necessary and as often as necessary without any danger to the patient.

Dr. G. W. Boot, Chicago: Is there such a thing as idiopathic web of the larynx? Are not all such webs the result of previous ulceration from some cause?

Dr. E. Mayer: I would make this one suggestion. I believe that these so-called idiopathic webs are tubercular. The interest there is in it is this. The early laryngologists like Schrötter and others were seeing these webs constantly and I want to ask the question whether in the case of the previous speaker, he had any reason to think his patient had tuberculosis. The patient I treated for so-called idiopathic web not only had interference with her voice, and a most peculiar cough and she got over it after dilatation, but years afterwards did die of tuberculosis.

Dr. E. M. Seydell, Wichita, Kans.: I would like to report a case of cicatricial web following diphtheria, mainly because of the ease with which the condition was relieved.

A child of five years suffering with a very severe dyspnea was examined by direct laryngoscopy and a web discovered below the cricoid. The opening in the same was about the size of the lead in a large lead pencil. I probed the opening and found the web to be very thin. A Mosher alligator forcep was used to divulge the membrane. The child made a complete recovery; this was over two years ago. I am wondering if it will return.

Dr. Henry Lynah (closing discussion): I have never used fulguration on any of my cases. The reason I don't use suspension is I can work more rapidly with a larygeal spatula and you waste so much time swinging them. I do it more simply and rapidly with the endoscopic tubes. In the matter of idiopathic web, I mentioned in my paper that the most common form is chronic hypertrophic subglottic laryngitis; probably in the doctor's case that was the cause. As to postdiphtheritic web, these cases in my experience, when properly handled, do not return.

THE VALUE OF LABORATORY EXAMINATIONS IN DIAGNOSIS AND PROGNOSIS IN OTO-LARYNGOLOGY.

SEYMOUR OPPENHEIMER, M. D., F. A. C. S.
NEW YORK CITY.
ASSOCIATE OTOLOGIST, MT. SINAI HOSPITAL; CONSULTING OTOLOGIST AT WILLARD PARKER HOSPITAL; CONSULTING OTOLOGIST AT GOUVERNEUR HOSPITAL,
AND
HENRY JAMES SPENCER, M. D.,
DIRECTOR OF THE LABORATORY FOR CLINICAL RESEARCH,
NEW YORK CITY.

The vital importance of the relationship existing between the laboratory technician and the oto-laryngologist is too well known to need emphasis or substantiation. The relationship well maintained means reliable, logical, scientific practice.

That the results of the laboratory may be trustworthy, it is necessary for the technician, in all but the simplest measures, to have had considerable careful training and a clear knowledge of the import of the examination made. This is becoming increasingly evident. It is no longer true that all men graduated since the colleges entered laboratory courses in the curriculum may become qualified laboratorians. There are those naturally fitted for this work as for any other human occupation.

The laboratory examination as an aid in oto-laryngology is given much less attention than it deserves. The practitioner must be sufficiently conversant with the methods used to properly evaluate the technician's report, for in the end the successful man is the one who balances the pathologic return with the clinical findings and in the light of experience accepts or ignores it.

In the work of our office the laboratory has been a very great ally. We shall give the principal types of examinations made and discuss them in the light of our own experience.

Urine.—The urine examination is now considered almost necessarily a routine procedure. We are concerned here with albuminuria, glycosuria, acetonuria and the microscopic presence of erythrocytes, pus cells and casts.

It is important that the examination be routine, and frequently repeated in some conditions, notably following tonsillitis and especially in its mild forms. Loeb has clearly pointed out

this relationship. He was able to rule out scarletina and diphtheria in four of the cases he presented; in fact it is interesting to note that in the latter condition the nephritis arises concurrently with the acute disease, while it tends to follow the tonsillitis in the cases cited. In his papers he reviewed the findings of several workers and showed that the relationship has been recognized for some time. He referred to the work of Leyden in 1881, who drew attention to that form of so-called acute spontaneous nephritis following exposure to cold and wet, characterized by a slight fever, hematuria and albuminuria in which cases he was able to secure to history of tonsillitis very frequently, and he thought it the most important antecedent condition. Morse considered tonsillitis a dangerous disease and advised routine heart and urine examinations following it. Loeb found that the urine changes come on insidiously with very mild albuminuria, with only a few erythrocytes microscopically, and with no symptoms except lassitude. The nephritic changes seem to follow mild as readily as severe tonsillitis. Many of the nephritis cases run a mild course to death, others clear up entirely, and a third class have repeated acute exacerbations. One observer reported as high as seventy-five per cent of his cases of tonsillitis followed by albuminuria.

The temperature changes which occur in accessory sinus infections can frequently be traced to the pyelitis which is set up as a metastatic process. This is true too of suppurative otitic disease. It has not been an infrequent experience to observe small children with an acute otitis, with a high temperature, where the question has arisen as to the necessity of a mastoid operation, where a careful urinary examination has disclosed a pyelitis as the causative factor and not a mastoid complication. Let us emphasize that you insist upon a quantitative statement of the formed elements without which you cannot form a correct estimate of conditions.

The presence of glucose is important. Prognosis is markedly affected by it. Treatment is made much clearer. If the sugar content of the blood can be lowered, suppurative processes are relatively easily handled. Ordinarily, but not constantly, the rendering of the urine sugar free is a good index. Occasionally the percentile sugar content of the blood may remain high although no sugar appears in the urine. This rarely occurs in diabetes, and it is here that the condition is most important, rendering infection of the wounds much more likely than with the healthy person, probably on account of two factors; the altered

metabolism of the body renders the tissues less resistant to bacterial invasion, and the presence of the added glucose in the serous fluids of the body makes them even better culture media despite the bactericidal substances present. In major operative procedures which are not of an urgent nature, such as a mastoid of not a very acute type, laboratory control of the results of dieting and medication of the patient to determine the most advisable moment to undertake operation can be readily carried out and renders the prognosis of the case much better.

Acetonuria is of variable import. Whether an associated diabetes exists should be carefully determined. It may follow anesthesia. Its importance lies in the fact that it may indicate an acidosis so grave that it accounts for symptoms or contraindicates operative interference for the time. The determination of the carbon dioxid capacity of the blood plasma measures for us the gravity of an existing acidosis.

Blood.—The importance of determining the coagulation and bleeding time has been pointed out in a previous paper. It concerns those cases where there is any suspicion of the existence of hemophilia or purpura. Unless predetermined an unwarranted risk is assumed. The methods in use, while open to some theoretic objections, are serviceable and give the information wanted. Each method has its own average time which should be known and which may vary considerably from other methods. Practically all of them are simple and rapidly carried out.

In the observation of some five hundred patients, it was observed that the coagulation time might be prolonged and the bleeding time normal or vice versa. In fact, the authors were much impressed by the frequency of protracted bleeding time in individuals who showed a normal coagulation time. This brings up a most important point in connection with an operative procedure to be undertaken.

The chemical blood examinations are coming into greater and greater prominence. They will be treated later in this paper.

The value of the blood count is well proven. Both the total and differential estimates of the white blood cells are valuable and always will be so despite the frequent publication of cases where no help was derived. A further aid is secured by reducing the differential estimates to whole numbers rather than percentages or by applying one of the diagramatic methods advocated by Gibson and Sondern. From time to time the erythrocyte count and the hemoglobin estimation will prove of value.

In obscure suppurative conditions, as for example in a mas-

toid under suspicion, a progressive polynuclear count may prove to be the determining factor in advising operation. The leucocyte count forms a good index as to the resistance of the individual.

Sputum.—A sputum examination should mean a great deal more than it usually does and should be performed much oftener. Well does one of us remember facing a patient who had a mass on one vocal cord, who had been examined by four laryngologists of repute, as well as a widely known surgeon who could not agree in the absence of definite physical signs as to whether the diagnosis was syphilis, carcinoma or tuberculosis. In five minutes a sputum examination settled the matter beyond doubt.

An examination should always give a good idea of the predominating organism or organisms as determined by smears; should include the gross characteristics, such as color, odor, sedimentation, elastic tissue, Curschmann's spirals and the microscopic presence of blood, eosinophiles and so forth, and very frequently should employ cultures to check up the result of the smears. Such an examination would be a real aid in determining pneumococcus types, in fixing asthmatic cases as bronchial in type and in differentiating bronchial and pulmonary conditions.

Spinal Fluid.—The findings secured by lumbar puncture are of great help bacteriologically following otitic disease. The cytologic examination should never be omitted as it alone may determine a concurrent condition of importance. The test for reducing substances is of some aid indicating whether an inflammatory process exists. The globulin tests, of which Noguchi's is the more sensitive, give some information.

Oppenheimer has pointed out the important aid to diagnosis secured by lumbar puncture. While recognizing the dangers of the procedure, he demonstrates its value in cases where doubt exists as to the process taking place. With a positive fluid the intracranial and intraspinal condition can be quickly determined and the prognosis possibly favorably changed by timely action. Changes discovered early make successful operation much more possible.

Only localized meningitis or abscess will give a negative fluid. In the face of negative findings, depending upon clinical conditions, one may wait and repeat the puncture later. High pressure of the fluid is very important. Normal or low pressure may mean nothing. The finding of organisms, especially the tubercle bacillus, is conclusive evidence. Normally six to eight cells per cubic millimeter are found and are almost all of the

mononuclear type. Suppurative conditions yield a polynucleosis. Increased lymphocytes suggest tuberculosis, poliomyelitis or lues. Brain tumors and brain abscesses frequently cause only an increase in the pressure.

Serologic Tests.—Serologic examinations of the blood, spinal fluid and the serous effusions are now so widely used and so numerous that their value needs no emphasis.

Despite the fact that the Wassermann test for syphilis has been severely attacked for the thirteen years of its life, it has steadily held and gained a following. Theoretically we know its weakness. Practically, above all opposition, it has proven of value. A (great) danger lies in the unquestioned acceptance of its results. Conscientious serologists are urging a standardization of technic, rather than a development of modifications of the original technic. The method is not foolproof yet and incompetent technicians are giving cause for much of the distrust of the test and should not be tolerated. Many of them seem to have no conception of exactness of working. In our work the test has undoubtedly proven a great aid in determining what certain obscure conditions may be due to.

In reviewing our case histories, having performed the Wassermann reaction as a general routine over the past two years, we find a series of thirteen patients whose blood sera gave a very strongly positive reaction, who showed no signs which would be suggestive of syphilitic lesions in the nose, throat or ear. Another group of twenty-one cases was found whose complement fixation reaction was very strongly positive and who were suffering with the following conditions: One case of a tumor of the auditory canal, two cases of perforation of the nasal septum, four cases of suppurative ethmoiditis, two cases of leukoplakia, two cases of sound perceptive deafness, one case of ulceration of the mucocutaneous juncture of the nose, one case of optic neuritis, three cases of marked hemicrania, supposedly referable to the nose, one case of chronic suppuration of the maxillary sinus and one case of fissure of the lip.

One does not presume too much in making the statement that the great majority of these patients would not have had a proper diagnosis made if it were not for the fact that Wassermann reactions were made as a routine measure.

The more recently developed serologic tests for pertussis and tuberculosis are theoretically sound. As yet the latter can be considered only an aid because the reaction may be given by an arrested case. The result must be checked carefully by clin-

ical observation and in doubt should not be accepted without reservation. The pertussis test gives results early enough in the disease in a fairly large percentage of cases to make it well worth applying.

Complement fixation tests are now being used for determining the specific proteins that asthmatics and hay fever patients are anaphylactic to. The sensitization tests are performed with specific antigens prepared from the animal, vegetable and bacterial substances which may play a part in a given case. Their value has not yet been established.

Almost all of these tests are open to the objection that they are not localizing in their results and therefore may not indicate what a particular focal process is due to.

Bacteriologic Examinations.—Two principal types of study are applied here, the first by smears and the second by cultures.

Smears demand more care and attention than they are ordinarily given. They are in competent hands of the greatest aid and the oto-laryngologist who fails to make several on each case so that appropriate stains may be applied, fails to use a valuable method. The Gram stain, too often improperly applied, gives an abundance of information.

Bennett points out its value as: 1, showing the type of predominating organism where in culture the organism might be swamped by faster growing varieties; 2, showing phagocytosis of a given organism, thus indicating the one for which a vaccine should be prepared; 3, to indicate the effect of a vaccine in use. He found that the organisms could often be classed with accuracy by smear, all of his work being checked up by careful cultures. The fusiform organism of Vincent's angina can be secured only by smear, as it does not grow on any known medium. He found the smear of value in prognosis also because of the ability to differentiate simple, easily yielding conditions as those due to M. catarrhalis, from more stubborn ones, as those due to the streptococci. The fusiform organism always meant necrosis.

The bacterial flora varies greatly with the part studied, its state and the methods employed in studying it. Thus the nasal cavity of the normal healthy person contains very few organisms and those often in pure culture, seldom more than three kinds. Logan Turner has pointed this out and states that these are usually not virulent. The healthy accessory sinuses are most frequently found sterile. In catarrhal conditions the staphylococci, streptococci, pneumococcus, micrococcus catarrhalis, B influenzae, meningococcus, Klebs-Loeffler bacillus and tubercle bacillus are important invaders.

In the mouth a much greater variety is of course found upon the mucous surface but when the tonsils are enucleated and the organisms of the depths of the crypts studied, relatively few species are found and these in pure culture or small mixed groupings. Thus Maclay found that staphylococci, streptococci and pneumococci occurred in a pure culture in that order of frequency in eighty-seven out of two hundred and sixty-eight cultures. Negative smears meant nothing as growths were commonly secured despite them. Moreover the smear might show a certain organism predominating while in culture another would promptly overgrow it. Tubercle bacilli were found by smear only once, and never by culture. Guinea pig inoculation was not attempted. We know how often this last method has proven valuable in the work of numerous investigators. Hemolytic streptococci were determined seventeen times but the viridans only once, which Maclay thinks was an error which would be corrected by using proper blood plates.

Cultures.—Cultures are of great value when positive. When negative it is perhaps best to disregard them in most cases. At times they are of great help; for example in tuberculosis, erysipelas or acute rheumatic fever, in ruling out possibilities. These statements do not hold, however, in the case of *blood cultures.* Here, a positive or negative culture is always significant, as we have pointed out in a previous paper.

Lake distinguishes between a bacteriemia where living organisms are practically continuously in the blood stream and a pyemia where their presence is casual. The clinical picture is usually clearly different. The prognosis depends largely on the basic condition. Bacteriemia which is rare in other bone diseases is not so with mastoid conditions, but in our experience has not been seen unless a complicating sinus thrombosis existed.

Oppenheimer, after stating the necessity of early operation in lateral sinus thrombosis, points out the characteristic phlebitic symptoms associated with mastoid disease and advises operation in the presence of a positive blood culture especially if of the streptococcus group.

In another paper, Oppenheimer has pointed out the value of blood cultures in metastatic complications of suppurative otitis media, especially in conditions due to streptococcus simulating acute rheumatic fever. In five cases, in which the otitic condition had been somewhat lost sight of in the presence of an acute polyarthritis, blood cultures were positive and a sinus thrombosis

was found. In one of the cases later blood cultures were positive despite the fact that the jugular ligation and exsection had been performed. At autopsy vegetations yielding the same streptococcus recovered from the ear and sinus were found upon the heart valves. In this case streptococci were recovered by aspiration from the knee joint. The routine employment of blood cultures in many acute febrile conditions would undoubtedly clear up many obscure, unsatisfactory diagnoses and probably would render the prognosis more obvious in many of them.

The information which is derived from the laboratory in the taking of blood cultures in a case of otitic disease cannot be overestimated. Their negative findings as well as positive ones offer much guidance to the clinician.

The detection of a bacteriemia should be possible in every case of sinus thrombosis at some time during the course of the disease, although it is possible that as the result of various causes such as a sterile thrombus situated below the infected clot, for a time at least, a bacteriemia might be prevented from becoming evident; or the culture may be taken before the bacteria are thrown off into the circulation; in the latter instance, if the culture were taken a few hours later, the organisms would be found. It is also possible that the powers of hemic resistance are greatly increased, and all of the circulating bacteria might be caused to disappear within a comparatively short time by a highly developed bactericidal power of the circulating fluid, or it is possible that there may be such a small number of organisms in the blood that in the minute quantity examined they may not be found.

Following a mastoid operation, where a sinus thrombosis is suspected but where symptoms are not sufficiently definite to warrant opening the sinus, and a blood culture has given negative results, it is most essential that subsequent cultures be taken. This method will be found of great value in clearing up an obscure case that might not be relieved by operation until a much later period. The rule can be laid down that in the presence of streptococci in the blood stream, there is a septic focus and that further operative measures are necessary.

In the case where the sigmoid sinus has been attacked but the jugular vein has not been ligated, the persistance of a possible blood culture is an imperative indication for the ligation of the jugular vein. Should positive cultures remain after the jugular ligation, it would be suggestive of a bacterial infection of the endocardium or a metastatic process in the lung.

In our experience, dealing with approximately one hundred

and fifty cases of sinus thrombosis, we have never observed an infection due to any organism other than the streptococcus mucosus. This point has proven of very great value in expressing an opinion in many instances, and shows the importance of making a culture from the pus contained in the mastoid process at the time of the operation.

For example: We have seen a number of cases where the infection in the mastoid was of the pneumococcus type and where after the mastoid operation symptoms presented themselves which were suggestive of a complicating sinus thrombosis. The blood cultures were negative.

In counseling against operation upon the sinus in these cases, our patience was rewarded by having subsequently developed pneumonia, erysipelas or some other complicating condition which explained the symptomology so much akin to that found in sinus thrombosis. One can see therefore the significance of the negative blood culture in conjunction with a nonstreptococcic type of infection.

In conclusion, we may say, that cultures from nasal or tonsillar secretion or otitic pus, blood, spinal fluid and the like, give a great deal of valuable information which carefully studied makes the prognosis clearer, and in addition may form the starting point for the preparation of autogenous vaccines which properly prepared and administered, provide us with one of our best methods for combating infection.

Tissue Examinations—Joseph Beck, of Chicago, has repeatedly emphasized the value of the examination of material from mastoid operations. He is able to distinguish two types of acute mastoid involvement which he classified as (a) the cell route type, which bleeds freely on operating, is soft, has most of the septa destroyed, the bone appearing as chips in the swollen mucous membrane and heals rapidly, and (b) the vascular type, which bleeds little, is firmer, but otherwise appears the same in the gross, the bone undergoing slow necrosis because of a minute thrombosis in which healing is much delayed by the necessity for the necrosed parts to separate. The streptococcus and micrococcus catarrhalis are the commoner organisms in the latter type as against the staphylococcus, pneumococcus and bacillus influenzæ in the first. Here then the etiology is of great importance. The laboratory aids in diagnosis and prognosis.

In chronic conditions the examination is equally important in distinguishing fibrous from cholesteatomatous, tuberculous, neoplastic and other conditions, while serologic tests clear up the cause for the sluggish healing of the luetic cases.

Likewise many workers have found examination of the lymphoid tissue of the naso-pharyngeal and faucial regions of great help in diagnosing tubercular conditions.

Cutaneous Tests—Certain cutaneous tests have now been developed which play an important part at times. The von Pirquet is the oldest of the group. In children it is undoubtedly of value whether negative or positive. In adults it is so seldom negative that one is tempted to ignore it completely. It is so simple and so quickly done that in appropriate, puzzling cases it should be applied with due allowance made for its limitations. The less sensitive tuberculin tests, such as the Moro test, may prove more valuable in adults in the long run.

The luetin test is rarely used because of the cost and the readily available Wassermann test.

The Schick test is of the greatest value in prognosis. Care must be exercised in applying the test. The diphtheria toxin is readily secured and with care will keep for about six months. When diluted it should not be kept over twenty-four hours.

The specific proteins have recently come into use for diagnosing the particular causative agent acting in a case of pollen disease or bronchial asthma. Packets may be secured which contains extracts in powdered form of the specific proteins of many substances both animal and vegetable. These are put in solution and applied to scratches on the skin where reactions to one or more of them may occur indicating some or all of the proteins which affect the patient. This gives opportunity for greater exactness in diagnosis and if desensitization can be carried out, prognosis is improved.

Renal Functional Tests—The renal functional tests are the outcome of the work of a group of clinicians and physiologic chemists, which tests have reached a stage of perfection which warrants their very wide application. *This statement especially applies to all who carry out surgical procedures under general anesthesia.* J. B. Deaver very recently presented some of his figures secured since using two of the tests, blood urea and phenolsulphonephthalein. Of 420 cases (tested) operated upon, 403 were considered suitable and only one died of uremia. Seventeen were reported unsuitable and of these, operated upon only as a last resort, seven died of uremia. The same general results have been secured elsewhere.

The tests referred to are the estimation of the uric acid, urea nitrogen, creatinin, and sometimes sugar, of the blood and the

red or phenolsulphonephthalein test. Their use is indicated wherever the urine examination or history presents any suspicion of nephritis or diabetes. The blood chemical tests indicate the grade of kidney injury or the working capacity of the kidney, while the phenolsulphonephthalein tests give only the function of the moment. The blood chemical group is the more important but the phenolsulphonephthalein test should not be neglected. When kidneys are injured, the uric acid content of the blood rises first and as the injury becomes more grave first the urea nitrogen and then the creatinin are found increased. A rise of the last is of great import. These tests can now be carried out complete on 10 cc. of oxalated blood by a very recent method devised by Folin and Wu. The tests should be done only by a well trained chemist and are exact and relatively simple.

Whenever a major surgical operation is being considered and its need is not too urgent, a urine examination showing albumin, casts, pus, blood or a specific gravity so altered as to arouse suspicion of the functional capacity of the kidneys should lead one to have the blood examined chemically. If the uric acid or urea are moderately increased, no special anxiety need be entertained on this basis, but if the creatinin or sugar or both be raised, the prognosis becomes more grave and especially if the creatinin content rise above 3 mg. per 100 cc. No person having over 5 mg. has lived many months. These tests can be employed with a resulting much greater sense of security on the part of the surgeon.

We have presented those tests with which we are most familiar and which have proven useful upon employment in our work. There are undoubtedly others which we have overlooked.

This does not weaken our contention that the practice of medicine, including our specialty, is uncertain enough even with every safeguard thrown about it for us not to ignore these very valuable aids. In the last analysis, as we have pointed out, the clinical picture is equally important and in case of a conflict between the two, that man who studies and employs both thoughtfully is the one who will best be able to decide which to take as his guide at the critical moment.

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DISCUSSION

Dr. Joseph C. Beck, Chicago, Ill.: Twelve years ago I presented a paper on laboratory technic in Oto-Laryngologic practice. At that time I recognized its importance in connection with our work, and I have since then practiced it routinely in having my own control or my laboratory findings. That has avoided a good many difficulties that I had formerly in sending material to the laboratory and getting a written report, not knowing anything about the subject or the technic that was employed in doing this work. If you have your own laboratory next door to your consultation or operating room it is a good thing. Until very recently I joined with other members of our hospital in one laboratory, but I found that was not good enough, so I had a little room fixed up in which to carry on this work. I have a technician who is informed on the subject that we are interested in, namely Oto-Larynogology. He studies the pathology from the point of view that we are looking at it and the results are very much better than when a general pathologist does the work. Now, all the tests Dr. Oppenheimer mentioned here, blood, urine, sputum, Wassermann, etc., are carried out. However, we stop there. We do not take the question of cutaneous tests, nor the urine tests so far as function of the kidney is concerned, for we might go on indefinitely. That is an internal medicine or general surgery proposition. The technician doing the work for me must be a good bacteriologist, a good serologist, a good tissue diagnostician, and especially good on Wassermanns. Dr. Oppenheimer called attention to routine Wassermann. It is important that every case, even if it be a fracture, has a Wassermann, for that will aid in the diagnosis and treatment. Whether it is one, two or three or four plus is important. One laboratory technician told me that a one plus with him meant syphilis. There is no doubt about it and we accept that. After giving a dose of salvarsan or potassium iodid or mercury, the next test, as a rule, will show a greater reaction. This is known as provocation. I made a note here of tests of the blood that should be made, that the doctor did not mention. We are concerned with anemia secondary to sepsis and secondary to hemorrhage and we are concerned very much in the treatment of these conditions by transfusion. Therefore the test of the

blood of the donor and recipient is important. Another test that is of value that we do not use enough is the Abderhalden test. I think we will learn more about this as we go on as to the certain location of diseases. There is a man in Chicago who claims he can localize brain lesions by the Abderhalden test. Now, I would like to say something here about the cultures of tonsils. For a long time I have doubted the importance of the material that we squeeze out of the tonsils. I do not believe that most of the organisms are causing so much destruction as is caused by apical infection of the teeth. I have thought that if the tonsils are the cause of the trouble, it is not within the crypts, but outside of the tonsil, on the outside of the capsule, within the deep fascia of the neck and down into the muscles of the neck. Experimental proof of this contention: In this form the one tonsil is hardened, sectioned and stained for microscopic examination, for microorganisms. It will be found that within the substance of the capsules, there will be streptococci. The second tonsil is seared over the folded capsules. Then immediately open with a sterile knife this seared area and pass a platinum wire into the pocket made by the eversion of the capsule. Thus one will obtain an uncontaminated culture from the outside of the tonsil.

In the Sluder operation or any of its modifications the tonsil capsule is folded upon itself and the supratonsillar area is entirely closed off in the removed tonsils. (Illustrates.) I am not prepared to give the results of this work at this time. It suffices to say that it is a very important proposition. In reference to microscopic sections Dr. Oppenheimer spoke about the histologic examinations of mastoids. It is of greatest value in after treatment whether you are dealing with a cholesteatoma not demonstrable at operation, but an infiltrate into the bone, resulting in a slow healing. Not only should we examine mastoid chips and suspected carcinomata but so-called nonmalignant tissues that we remove. For instance, in sinus operations the membranes lining these cavities should be examined. Examine your turbinates microscopically and if you study them more carefully in the laboratory you will be able to handle the cases better clinically.

Dr. L. D. Heitger, Louisville: I wish first to call attention to the fact that there has been very little in our oto-laryngologic literature regarding purpura and hemophilia. I had occasion to look it up last spring and only found one reference in our literature regarding hemophilia, and in this one case it was spoken of as a female hemophiliac, while, according to the terminology, we know there is no such thing as a female hemophiliac. Hemophiliacs must be males. Purpura is one of two types—congenital or acquired. As to the character of the clot in purpura, in these cases you have the bleeding time simply prolonged, the coagulation time is practically normal, but your diagnostic feature is an estimation of the blood platelets. I had a case of a young school teacher and the question came up of removing the tonsils. She had 80,000 blood platelets. The internist did this work for me and he advised the use of serum and watching the time until her blood platelets would come up to a figure which would warrant operation. We observed her for a month and finally got her blood platelets up to 86,000. These conditions I think are overlooked, and from the facts our literature is so sparse, I think Dr. Oppenheimer is to be congratulated. And in the future, if we avail ourselves of these diagnostic measures we will be able to do a better class of work than the general surgeons are doing.

Dr. J. A. Stuky, Lexington, Ky.: Several points I want to call attention to after reading the abstract, one of which is that we, as oto-laryngologists are too prone to act on what we see and not to get the help of the laboratory man as often as we should. We are too well satisfied with

one blood examination, the examination of one smear, one test of the urine, one test for autointoxication. It takes more than one, and we must realize that we as otologists must be more than otologists. We must be either an all-around medical man or we must have the assistance of others who are experts. I have had rather a peculiar experience for the last six weeks in which I have been called in consultation recently four times by competent men who were waiting for more classical evidence of mastoid involvement, and in two instances they have waited until their patients were on the borderline of very serious trouble. I believe, had they resorted to the daily examination of the blood and discharge from ear by the man in the laboratory, this mistake would not have been made. There is a little tendency in the South to place no dependence on the blood count and the examination of discharge from the ear, but if made carefully and frequently, we have evidence not only to guide us in what to do now but in the after treatment. If I have had competent help by the bacteriologists before I operate, then I have reasonable ground to determine what to expect in the future. At any rate, I know better how to fortify my patients.

Dr. Oppenheimer (closing discussion): Dr. Beck has referred to the fact that there is some variation in the Wassermann test and that his laboratory man considers plus one as syphilis, but I want to make this point—there is a great difference in the character of the antigen that is being employed. Some tests are very much finer than the Wassermann, for instance the cholesterinated antigen test is, and it has not been a very infrequent experience to have a test with the Wassermann prove negative and with the finer tests they are found to be plus three or four.

An occurrence which I had in practice recently that has been the subject of considerable thought, was the case of a child with a sinus thrombosis in which my laboratory man fortunately had taken the precaution to run two sets of cultures, one aerobic and the other anaerobic. In this particular case we were evidently dealing with some unusual type of streptococcus. In the aerobic culture we failed to get any growth but in the anaerobic cultures we got a growth.

Dr. Heitger raised a very important question on the subject of blood platelets in cases showing a protracted bleeding time. It is our practice to estimate the blood platelets and only when our blood platelet count has come up to normal do we attempt any operation. I have one case in mind, that of a man under observation for six weeks. The patient required a nasal operation. Having gotten this man's blood count to normal we undertook a surgical procedure. We left the packing in longer than usual removing the same at the end of the second day. This patient went to his home away from the city, and the following day developed a secondary hemorrhage. We brought this patient back to New York and injected human serum to control the hemorrhage, but at the same time we took a blood platelet count and found it had become very markedly reduced in the short time between the last examination and the operation.

Dr. Stucky mentions the question of blood counts. They are important, of course, and it may be a determining factor in an obscure case of mastoid disease as indicating the necessity of an operation. I do not think one count is valuable always. We may have no definite alteration in the polynuclear count, but if you take a series of counts over a period of few days showing a progressive increase, that increase may be the factor in determining the indication for an operation. Of course the ear discharge examination is necessary. We know our staphylococcic infections as a rule do not go on to operation as frequently as other organisms of more virulent type.

THE DIAGNOSIS AND TREATMENT OF LATENT ANTRUM DISEASE

H. B. LEMERE, M. D.
OMAHA, NEB.

In the title of my paper I use the term "latent antrum disease." The word "latent" is used by me in this connection to specify antral infections which are obscure and do not have the outstanding symptoms of either acute or chronic antrum disease. These obscure cases are generally low grade infections, yet some show recurrent acute exacerbations when the condition becomes very evident and is no longer obscure.

In the diagnosis of these conditions I have found transillumination very unsatisfactory. With an antrum full of opaque pus the shadow from the lamp is very decided. With these low grade infections there is often only an infected mucous membrane with very little free pus and under transillumination no definite shadow is produced. One of the standard signs of antrum disease is, therefore, lacking.

In searching for focal infections I have made it a routine practice, for sometime past, to examine carefully skiagraphs of the nasal sinuses. The pictures are taken in different directions and each serves as a control to the others. I have a lighting cabinet in my office and I examine the plates personally, comparing my findings with the diagnosis from the roentgenologist and with my own clinical observations. After over a year of careful study I have come to the conclusion that there are many infected antra which I formerly did not recognize. I have no doubt that, with the vast improvement in roentgenology and with its increased employment, many men are also discovering these low-grade infections, but unfortunately attention has not been called to the importance of their discovery and treatment. They are often not recognized because the two classical dignostic signs of a dark shadow by transillumination and of pus under the middle turbinate are not present.

I have already referred to the unreliability of transillumination. It often fails because the secretion is of a glairy translucent consistency which does not show in transmitted light but which shows a definite shadow with the x-ray. This glairy pus is often

hard to distinguish in examination of the nose either by anterior or posterior rhinoscopy.

In the diagnosis of nasal sinus infections, I have learned to rely very greatly on the condition of that lymphatic tissue in the pharynx lying in a vertical streak immediately posterior to the posterior pillar fauces. When infected secretion is being drained into the pharynx this tissue becomes acutely congested and stands out as a decidedly red swollen band and this always means either acute or chronic nasal infection.

In studying the skiagraphs, if only those cavities are considered diseased, which show a marked opaque shadow, there will be many foci of infection passed over. I classify my shadows as clear, questionable, cloudy and opaque. I have at least three plates taken in different positions. In determining the degree of opacity, the antrum shadows are compared not only with each other but also with the other nasal cavities. Each picture is considered a control on the others and under these conditions a slight degree of cloudiness shown in every position has an intensified significance, and when combined with the enlargement of the pharyngeal lymphatic pillar, it is diagnostic of a low grade infection.

The importance of these low grade antrum cases lies in the general or remote symptoms resulting from them. Many of them have no localized pain or even discomfort from the discharge and there is little to call attention directly to the antrum. The symptoms are remote and are those which are becoming more and more recognized as due to focal infections. The most important of these, which have appeared in my cases have been generalized headache, neurasthenic symptoms, anemia, chorioretinitis, ocular muscular weakness or paralysis, catarrhal otitis media, otosclerosis, cardio-vascular, and nephritic changes.*

The treatment is necessarily operative, and only in those cardio-vascular cases, in which operation must be excluded, are we justified in simply removing swollen middle turbinates and polyps and attempts at drainage by nasal washes and sprays. An antrum once chronicly infected cannot be restored to health except by drainage instituted by operation. The operative procedures for antral conditions described in the text books, and in general use, I find generally either too radical or not efficient.

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*Since writing the above, I have seen a unilateral well marked (+ 2.0 D. elevation) optic neuritis which was dependent upon a unilateral latent antrum disease on the same side. The eye condition responded immediately and very rapidly after thorough drainage of the antrum.

The Caldwell-Luc, and the still more radical obliterating operations, are far too radical and are not intended for the mild grades of antral infection I have described. A strong objection to an extensive operation is the length of time it necessarily consumes even with a skilled operator. Many of these cases of obscure antrum disease are being operated upon because the continuous source of infection has produced a very unstable nervous condition or cardio-vascular or nephritic changes so that a short operation with shock at the minimum is imperative. The radical operations do not come under these requirements. On the other hand, it seems to me that the intranasal operation requires a large amount of cocain, and the anesthetic effect on the inner wall is uncertain, so that the patient is frequently in such a nervous condition that the operation is completed with an insufficient opening. It is also generally necessary to amputate the anterior third of the inferior turbinate not only to provide room for operation, but to render possible subsequent irrigations, which would otherwise be difficult and painful. The sensitiveness of the nose after the intranasal operation, and the lack of any oral patent opening remaining after the classical oral operations makes irrigation of the antrum difficult after both nasal and oral operations till the reaction of the operations has subsided. I consider this a decided disadvantage. My procedure is not new and no originality is claimed for it. The purpose is (1) an operation with the minimum amount of shock. (2) A permanent free opening into the nose. (3) Means of carrying out constant irrigation in a manner painless to the patient. The following is a brief description of the means taken to attain these ends:

Ether anesthesia is used commencing with a mask and continuing with Beck-Mueller ether apparatus with the mouthpiece. A large retractor elevates the upper lip, and a horizontal incision one inch long is made in the line of the junction of the mucous membrane of the gums and the cheek and in the meridian of the canine fossa. The periosteum is raised. A Hudson drill is used to enter the antrum from its anterior wall. By using the second sized burr the hole is made sufficiently large for instrumentation. A medium sized round spoon mastoid curette is introduced through this anterior opening and an opening made low in the nasal wall one-half an inch in front of the posterior limit. Forward cutting forceps are now used to cut the opening forward as far as possible, always hugging the floor. A large spoon is used finally to finish off the opening. A perforated tube is now

introduced through the oral opening and tied in place with one suture. This tube is long enough to extend out of the mouth. The whole procedure takes usually about five minutes and the postoperative shock is not nearly so severe as from a tonsil operation. On account of the obstruction of the field by bleeding the opening into the nose is made by the anatomic knowledge, and the sense of touch.

If time is taken to maintain a clear field and to stop hemmorrhage, the operation is lengthened beyond the desirable limit. The operation is a modification of the Caldwell-Luc but the use of the Hudson drill thus speedily getting an opening into the anterior wall, the preservation of the inferior turbinate, and of the antral mucosa, which is not curetted, and finally and chiefly the providing for constant irrigations after the Carrel method, transform the operation from a radical procedure to the most conservative operation on the antrum. The mucous membrane of the antrum is conserved, the inferior turbinate is conserved, the strength of the patient is conserved. It is wrongly called an external operation as nowhere is the skin scarred nor is there any deformity. It is an oral operation, not an external operation.

The after treatment consists in washing through the antrum the night of the operation so that the nose may be clear and sleep possible. After the first day there is a through and through washing with some mild alkaline and antiseptic solution. This can be done absolutely without pain through the projecting tube and is carried out every half hour while the patient is awake. A solution is placed near the patient and his cooperation enlisted. The morning of the fourth day the tube is removed and the hole remains sufficiently patulous for a few days to wash through with a small rubber bulb syringe. At the end of a week or ten days this can no longer be done and a De Vilbiss syringe is used to wash through and through as long as possible. The antrum is now generally clear from pus. A nasal wash is given and the patient is discharged. There may be an acute exacerbation on taking cold but it is easy to wash through the nasal opening and the infection subsides with practically no inconvenience. Convalescence is very rapid and the cleansing of this reservoir of infection produces as marked a change for well being as follows the eradication of other chronic foci of infection.

The report of numerous cases would be wearisome and serve no useful purpose. The following is a typical case showing an obscure antrum condition acting as a focus of infection to a condition not generally attributed to removed infections.

Mr. C. C., age 20, presented himself for eye examination April 30, 1919.

Right eye. V 20/20; w. — 50 cyl. ax. 90° = 20/10. Fundus normal. Muscular action normal.

Left eye. V Fingers at 8 feet. Unimproved. Fundus normal. Third nerve partially paralyzed in all its branches. Slight psosis, slight mydriasis. Eye diverges about 25° but has some motility inwards, upwards, and downwards. Normal excursion outward.

This condition has been present since patient was two years old, when without any discoverable cause the eye became paralyzed. This fall an operation for cosmetic effect on the paralytic squint was under consideration when the patient presented himself September 9, 1919, with complete ptosis, marked mydriasis and complete lack of action of the other ocular muscles supplied by the third nerve. He stated he had a cold.

Nasal examination showed right nasal cavity normal, left nasal cavity showed small scab on anterior end of middle turbinate. There was a slight swelling of anterior end of the middle turbinate with two small polypoid excresences. The middle meatus was free on both sides of the middle turbinate.

Pharynx: Both tonsils showed chronic infection. The left post tonsillar lymphatic pillar was swollen and very red. X-ray showed all cavities clear except slight cloudiness of the left antrum, persistent in four different positions of exposure.

The exacerbation of the eye condition seemed to the author dependent on an old latent antrum condition, the original acute infection of which was probably the cause of his original ocular palsy when two years old. The author's operation was performed on the left antrum followed by Carrel's irrigation. A specimen of the naso-antral wall procured by the punch forceps was sent to the University of Nebraska for examination. The report was, in part:

"In the submucosa there was marked connective tissue overgrowth, principally in the fibroblastic stage, with numerous lymphocytes. Diagnosis: Chronic Inflammation."

The postoperative history was uneventful, except that the complete paralysis recovered to the condition it was when the patient was first seen and he returned to college one week after the operation.

The connection between the antrum disease and the paralysis seemed to be intimate and I think we are justified in concluding that the original paralysis in childhood was dependent on an acute infection of the antrum which had remained the seat of a latent infection.

In conclusion:

1. The x-ray has exposed very many diseased antra which formerly were unsuspected. These low grade infections show only a faint but persistent shadow.

2. The author's method of dealing with these is constant irrigation according to the Carrel idea but with fluid less irritating to the nasal mucosa than Dakin's solution.

3. The means for this are provided by his operation, which also provides permanent drainage into the nose without destroying the inferior turbinate or the mucosa of the antrum and does this with a minimum of pain and shock to the patient.

AN ETHMOID OPERATION

J. A. Pratt, M.D., F.A.C.S.

MINNEAPOLIS, MINN.

INSTRUCTOR OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY, IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF MINNESOTA.

The only apology I have to offer for presenting "An Ethmoid Operation" to this Society, is that too many men allow ethmoidal disease to pass by, either because they are unable to diagnose the condition, or are afraid to operate.

Whenever the surgery of the ethmoid labyrinth has been presented to the Societies I have attended, so much stress has been placed on the uncinate process, the infundibulum, the bulla ethmoidalis, the hiatus semilunaris, the agger nasi cells and the accessory cells of the sphenoid, orbit, middle turbinate and the crista galli; to say nothing of the extreme danger of meningitis and opening into the orbit; I am not surprised that the majority of us are satisfied to remove the anterior end of the middle turbinate or turn the patient over to one of our colleagues.

In my opinion, there are a number of points to know and remember. That the anterior and posterior ethmoid cells comprise the so-called ethmoid capsule and are present at birth. Calling, as we do, the ethmoid labyrinth that portion lying between the two lateral plates of the orbits, seems to me not only a misnomer, but very confusing. We occupy ourselves with one ethmoidal region at a time, and as this consists of a maze of cells, it can rightly be called the labyrinth. We could still retain the name capsule but call the cells lying within the capsule, the ethmoid labyrinth.

The ethmoid capsules are separated from each other by two nasal spaces and the septum, and these spaces should not be included in the ethmoid labyrinth.

The later development of the frontal and sphenoid are seemingly an extension of the ethmoids, and are so placed as to be easily treated surgically, after exenteration of the ethmoids.

That the cribiform plate, or olfactory fissure is entirely outside of the ethmoid capsule, and if the middle turbinate is left in place there is practically no danger, if the operator has a careful and delicate touch.

That we should be able to visualize our operative area, and to do this, we must know our anatomy.

The majority of the operators, who have written in the past on surgery of the ethmoid, have advocated the removal of the middle turbinate or a portion of it. I am referring particularly to writers in this Academy and the Oto-Laryngological section of the American Medical Association. Whether these men are at this date still operating in this manner, I am unable to state, but think not.

I have not as yet found it necessary to remove any part of the middle turbinate in order to exenterate the ethmoids or open the frontal or sphenoidal sinuses intranasally.

In my opinion, the principle cause of ethmoid trouble is some abnormality of the septum, and we must operate the thick as well as the deflected septa, restoring not only ventilation, but equal distribution of air. Whenever the septum interferes with the ethmoid operation, it should be operated first.

In my clinical work I find anterior ethmoidal trouble when the frontal sinus is affected and generally disease of the entire ethmoid capsule when the sphenoid is involved. So we see that the ethmoid is the gateway to these troublesome sinuses.

When we visualize our sinuses, we find the lower part of the frontal in front of the anterior ethmoid; back of the anterior ethmoid and a trifle lower lies the posterior ethmoid and back of the posterior ethmoid and a trifle lower is the sphenoid; so if we start in at the anterior ethmoid and work backward horizontally, we come finally to the posterior wall of the sphenoid. We can roughly measure to the posterior wall of the sphenoid, by measuring the distance from the end of the nose to a point on the temporal side of the head, half way between the temporo-orbital edge and the auditory orifice. Marking our patient at this point and knowing the average anterior and posterior measurements of the ethmoid labyrinth and sphenoid, we can tell at once just where we are in these structures.

While the operation I am to present is original as far as I am concerned, undoubtedly hundreds of men are performing their ethmoidal operations in exactly the same way. I have been unable to find a description that places us on familiar terms with this important structure.

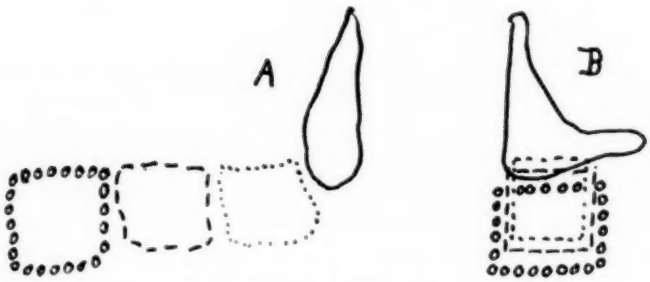

Plate No. 1. Diagrammatic

A—Showing a lateral view of the sinuses and their relative position. B—Showing an anterior-posterior view and their positions from an operative standpoint.

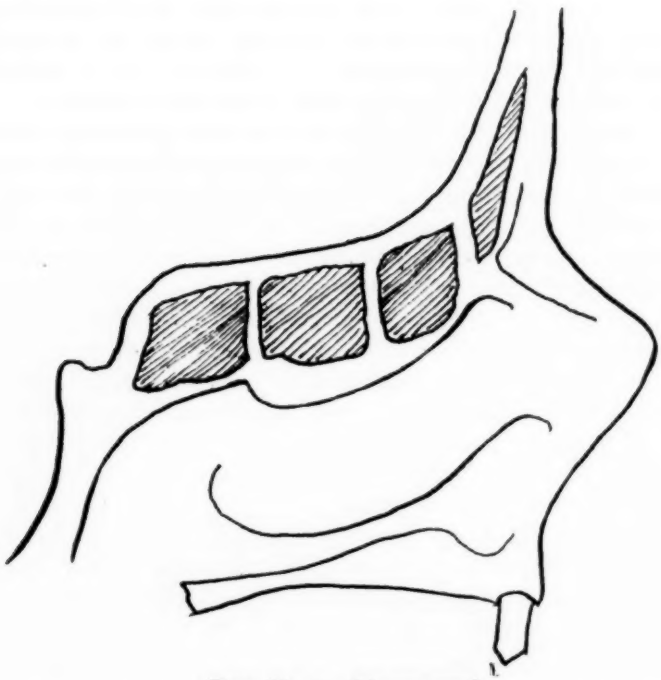

Plate No. 2. Diagrammatic

A lateral view with the sinuses in their relative position in reference to the middle turbinate. The anterior ethmoid is the gateway to the frontal sinus.

Operation.—The instruments necessary for the operation are a nasal speculum; a nasal cutting forcep (Gruenwald), with a fenestrated lower blade and a cutting blade of three by five millimeters, the thickness of the blade being five millimeters, which is about one-half the width of a normal ethmoidal capsule; a double end cup-shaped curette twenty-two centimeters long, with one bent at an angle of forty-five degrees, about two centimeters from the end.

After cocainizing the part in the usual manner, if there is

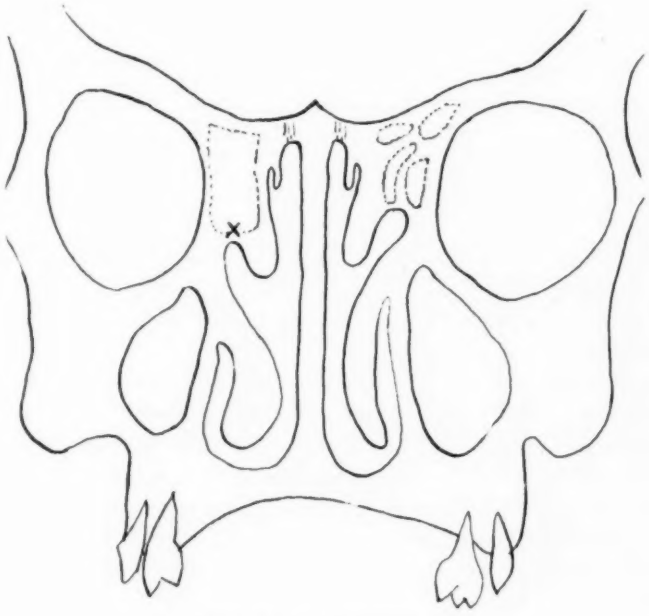

Plate No. 3. Diagramatic

An oblique cut, showing the anterior ethmoid cells opened on one side and not on the other. The x shows the point of entrance under the anterior end of the middle turbinate. The drawing shows the position of the ethmoid capsule, (outlined), and how the hanging middle turbinate protects the cribiform plate during the exenteration.

polypoid degeneration present, the anterior ethmoid cells are opened with the nasal cutting forceps, biting just under the anterior end of the middle turbinate, pointing slightly toward the eye and continuing backward and upward as long as there is soft bone encountered. With a mental picture of the ethmoid capsule, bounded as it is on the orbital side by the lacrimal bone and the ethmoid orbital plate, nasally by the middle turbinate, superiorly by the temporo-orbital plate and posteriorly by three-fifths of the

anterior wall of the sphenoid sinus; we take the straight end of the curette and with a firm but gentle stroke in every direction, curette out all the soft cells. If we find firm, smooth, yielding tissue under our curette on the orbital side, we know we are down to the periosteum of the orbit and force should not be used. With the angle end of the curette any anterior cells are now removed, enlarging the space upward toward the frontal sinus. We now cut out the floor of the capsule back to the sphenoid sinus, giving a free open space under the entire length of the middle turbinate. There is little bleeding owing to the fact that we do not cut the anterior, posterior ethmoid, or sphenopalatine arteries.

The cavity is now wiped out with large swabs using a whirling movement to collect any particles of bone or debris, and then a large swab of cotton saturated with a three per cent. iodin in glycerin is applied in the cavity for a few minutes to stop the bleeding, and disinfect the cavity. With a dry cavity any overlooked soft portions can be removed. If the capsule does not show definite softening or polypoid degeneration, the straight end of the curette is possibly the best instrument to use to enter the anterior ethmoid cells; however after some experience the cutting forcep is generally used.

The cavity is not packed but a finger-shaped piece of cotton is placed in the middle meatus and the patient is allowed to go home, with instructions to remove the cotton in four hours and report in three days. The home treatment consists of dropping a few drops of nasal oil into the nostril three times a day, having the patient in the prone position with the head well back and as the medicine is dropped into the nostril, sniffing violently. Every third day, after cocainizing and cleaning the nose, the cavity under the middle turbinate is swabbed with the iodin-glycerin solution. In a short time, it is hard to detect that the nose has been operated upon.

If, after a suitable length of time the discharge does not cease, the nose can be recocainized and the operation easily extended into the sphenoid or by the use of the Thompson-Good rasps, a large opening can be made into the frontal sinus.

ETHMOIDAL OPERATIONS FOR PANSINUITIS — OPENING THE ACCESSORY SINUSES—OPERATIVE DANGER ALMOST NIL, WITH GOOD RESULTS

W. Perry Reaves, M.D.
GREENSBORO, N. C.

The object of this paper is not to describe a new operation, but to discuss conditions that I believe essential to both operator and patient, that both may feel sure of the safety of the operation and a good result.

In mastoid surgery two operations have become standardized—the simple and radical. The operator may modify the technic and operation, but still he does the simple or radical. Many of you who have chairs in Universities or on Hospital staffs know well how much better the new specialist is equipped for mastoid surgery than sinus work, when he has received his certificates or diploma for a few weeks, months or years as the standard may be of each institution. I believe if the consensus of opinions of rhinologists were taken that the operation and the end results of sinus surgery would be about on a par with tonsil surgery some ten years ago, when clipping the tonsil, using punches to remove part of the tonsil and the finger dissection were in practice. These unsurgical, incomplete and traumatic operations, their poor results or deformities of the fauces have led to the development of the snare, knives, Sluder and other operations to enucleate the tonsil, until now the mother will tell you that she wants the tonsils removed with its capsule and soon she may add capsule only and not the muscle facia. Is it not possible to standardize ethmoid and sinus work? Something concrete and safe so that the specialist will develop in sinus surgery as he has developed in mastoid and tonsil surgery?

A forward step in this direction can be taken by protecting the patient from fear, pain and shock, and the operator from fear of accident that may happen when his technic is trusted to position and sensation of touch in an anatomic field that has its many variations and may be further distorted by the pathologic condition. Is it any wonder that the weak point in our specialty is sinus surgery? Is this the result of the tendency in teaching to sacrifice thoroughness and safety for speed? If

seeing is essential to safety for the average operator, then he must have his patient in a position that permits of seeing without giving both the patient and the operator the neckache, so often the result of the sitting posture. This is easily done in the reclining or semireclining position; any operating table will do. The Holmes chair is well adapted for this work, as you can get any position with it. The bleeding that goes into the nasopharynx is cleared from the throat and expectorated into a towel or basin. The blood in the field of operation is cleared by any of the operators' pet methods of sponging. In those cases of too free bleeding for sponging, he will find the blood suction apparatus a great aid. The preparation of the patient and the field of operation is another important link in the operation. A grain of codein by mouth or 1/6 grain of morphia by hypo. will do much to allay the fear of the patient and helps to control the pain. One should use the least amount of cocain possible to get anesthesia. This is done by applying it about the exit of the nasal nerve, roof of the nose, sphenoid opening and under the middle turbinate. The amount of cocain can be reduced to a negligible quantity by following it with 3 cc. of novocain and 2 mm. of adrenalin injected under the periosteum of the middle turbinate about the area of Meckel's ganglion and the septum, just opposite the sphenoid opening. The point of injection is not so important, as the infiltration from the middle turbinate will practically anesthetize the ethmoid region. We have now met our first obligation to our patient, boosted him up with an opiate, put him in reclining position, which practically eliminates fainting, substituting nontoxic novocain for toxic cocain. Under these conditions the operator is not rushed for time from the patient's standpoint. The operator can now do a thorough, clean ethmoidectomy and open the sinuses with little trauma to surrounding tissues, which lessens the postoperative pain and saves the operator's time in after treatment. In short, 30 minutes spent on the operation really becomes the operator's speed in the total amount of time given each case.

Those who have passed the experimental stage of operative danger in the rapid exenteration of the ethmoid cells with the curette or with forceps which remove the cells en masse, may find it hard to slow up to teach safety first to the beginner. My experience has been in these rapid operations, even one can do them without danger to the patient. The mucoperiosteum is curretted or pulled from the roof of the ethmoid and orbital

walls which is to become part of the roof of the nose and part of its external wall.

The periosteum of this mucoperiosteum as it passes through the apertures, especially as it passes through the ethmoidal foramen, may be stripped with its blood-vessels, giving the patient a black eye from orbital hemorrhage. This mucoperiosteum will not be reformed but instead the operative field of the ethmoid will be covered by granulating tissue, which will become scar tissue or a boggy mass to harbor infection. On the other hand, if we leave the mucoperiosteum covering the field of operation, which becomes part of the nasal wall—we have a membrane that performs the function in the nose almost as well as the mucous membrane that has been removed.

The desire to leave the operative field covered with the mucoperiosteum has robbed me of my speed in ethmoidectomies. The operative technic that is necessary to do this is also the technic for safety, which is the ethmoid cells must be removed from the ethmoidal roof and orbital wall with instruments that are sharp enough to cut cleanly, remove only that in the grasp of the instrument to eliminate any stripping or torsion beyond the instrument. The same principles apply to the sinuses, especially the sphenoid.

In deviated septum, preliminary submucous resection of the septum is necessary in some cases to have space to work and especially to see the field of operation.

One of our best teachers is by comparison—mastoid work has been standardized. If we can apply these principles and the technic to sinus surgery we have gone forward another step. Have you ever thought of the similarity in the mastoid operation and an ethmoidectomy? The first step in the mastoid operation is cutting through the soft parts and removing the external plate of the mastoid antrum with chisels, forceps, curettes or burrs. Would one dare from an anatomic knowledge, position and sense of touch, complete the operation with the curette, endangering the sinus, dura and facial? Such is not my observation—speed becomes caution at this point. The antrum is cleared of its contents. The operator hunts for the safety landmarks, the inner plate which covers the dura and sinus and the aditus ad antrum. From these points the adjacent mastoid cells can be removed, avoiding danger to dura, sinus and facial.

How like is the ethmoidectomy when divided into two steps. The first step is the removing the middle turbinate, the vertical

plate of the ethmoid with the superior turbinate and lower half or two-thirds of the ethmoid cell (see Figs. 1 and 2). In most cases one or more of the superior ethmoid cells have been opened that are large enough to enable the operator to see the roof of the ethmoid, his coveted "land mark." In those cases where he

Fig. 1.

Ethmoid knife in position, knife just in front of sphenoid, third hook engaging anterior end of middle turbinate ready to make cut forward as indicated by dotted line above instrument. Dotted line below instrument shows direction of cuts that would be made by straight knife and knife cutting downward.

cannot see the roof of the ethmoid, he must fight his way to the roof by gently biting off the most pendulous cells, using the probe to see that the roof is always higher than the cell that is being removed. From this point the operator follows up the removal of the ethmoid cells forward and backward or vice versa, with forceps adapted in size to engage the cells which are even higher than nasal roof (see Fig. 3). The forceps must be

sharp enough to cut cleanly, to prevent pulling or stripping of the mucoperiosteum.

The operator should keep in mind that some of the cell attachment is thickened, sometimes almost a ridge forming the beginning of the cell wall. This is especially true at the junction of the sphenoid and frontal bone forming the roof of the ethmoid. Here is the key to safety in removing the high ethmoid cells—use forceps that are small enough not to crowd—sharp

Fig. 2.
This shows first step of ethmoidectomy completed and antrum opened under inferior turbinate with punch without sacrificing middle turbinate.

enough to cut cleanly—always remove the cell proper and not its accessory wall of attachment at the roof—a good rule is to keep from 2 to 4 mm. from the roof of the cell—this will prevent trauma or stripping of the mucoperiosteum and the danger of cracking or perforating the roof.

In those cases where a pathologic ethmoid is impacted against the septum, the operator can soon become skilled enough to perform the first step of the operation as indicated in

Fig. 4. First, by removing the middle turbinate and enough of the ethmoid cells to probe the sphenoid, enlarging the sphenoid opening, and then with the large punch cutting upward and forward, removing any ethmoid cells extending over the sphenoid and into the posterior ethmoid removing enough of the cells, in some cases to enable the operator to see the roof of the ethmoid (land mark). Fig. 4 also shows operation to find the roof of the anterior ethmoidal cells.

After the high ethmoid cells around the infundibulum of the

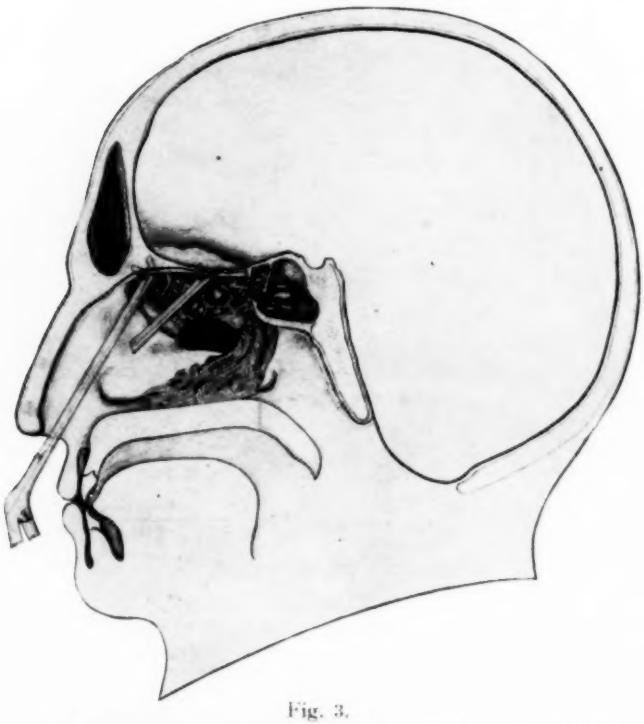

Fig. 3.

Ethmoidectomy completed. Large opening in sphenoid. Maxillary antrum opened in middle fossa. Instruments against roof of ethmoid, which is higher than roof of nose. Post nasal packing to prevent bleeding backward.

frontal sinus have been removed a curved probe in the majority of cases can be passed into the frontal sinus. This opening is usually sufficient with its favorable drainage to effect a cure. The pernicious habit of curetting the frontal duct into the sinus destroying its mucous membrane should be discouraged—which is exchanging mucous membrane for granulating tissue.

In those cases that do not get well, it will tax the operator's wits to do an intranasal operation to make an opening that will stay open and effect a cure.

The operation for opening the maxillary sinus is well established. If the space is sufficient between the inferior turbinate and orbital wall, it can be opened in the middle fossa (see Fig. 3). The opening in the inferior fossa does not require any loss of the inferior turbinate, which should never be sacrificed where

Fig. 4.

This shows method of operation when ethmoid is impacted against septum, using 15 degree angle ethmoid forceps instead of ethmoid knife, cutting backward instead of forward.

an ethmoidectomy has been done. With a sinus punch that has a small shank at its curve, the turbinate can be pushed up or cut a nick in its center, then the punch can be passed under the turbinate and remove the antral wall in the inferior fossa (see Fig. 2).

Fig. 1 shows ethmoid knife in position ready to make cut forward. The edge of the knife is directed slightly upward,

which will cause the knife to follow the upper dotted lines, especially if the handle is depressed a little as cut is being made. The ethmoid knife is made with three blades, the one in Fig. 1 with a tendency to cut up—one blade that has a tendency to cut down, and one blade that cuts straight forward. The dotted lines in Fig. 1 shows the different direction cuts can be made with three knives in removing the middle turbinate—part or all of the ethmoid wall.

The knife which is on a long shank with a ring for the forefinger is detachable from the handle proper, which is a great advantage in a close nose, as the knife with its small shank can be placed in position. Then the handle with two hooks is

Fig. 5

placed over the shank of the knife and introduced into the nose until a third hook is anchored at the anterior end of the middle turbinate, then with safety one can cut the vertical plate into strips and pieces if desired. The instrument is safe to use and easy to understand.

The sinus punch is one that I exhibited to the Society some six years ago, which has been changed to fit the universal handle and made stronger construction, retaining its size.

Fig 1. Shows ethmoid knife in position. The dotted lines show the variation of the angles of the incisions with the different knives.

Fig. 2. Shows first step of operation completed with probes

seeking safety land marks. After the incision has been made forward with knife as indicated by the superior dotted lines, Fig. 1, the ethmoid cells as high as the incision are easily removed by straight nasal forceps. Then the middle turbinate and vertical plate is cut loose from its posterior attachment with forceps or snare, or any other instrument or technic preferred by the operator. It is the completion of the first step that is important and not the instruments or technic.

Fig. 3 shows a (schematic) complete ethmoidectomy for

Fig. 6

Fig. 7

the relief of pansinuitis. The forceps against the roof after the operation is completed. The sphenoid has a large opening extending to the roof made by removing the ethmoid cells that extended backward over the sphenoid. The walls of the sphenoid and the ethmoid show the mucoperiosteum intact. The frontal duct is patulous. The unciform process can be left in many cases as shown here—which lessens the area of the operation, and is an aid in the new architectural formation of the ethmoid area after the operation.

The maxillary sinus is opened in the middle fossa which does not require any sacrifice of the inferior turbinate which is the distributor of the inspired air upward. Plus these conditions nature abhors a cavity and in a few months seems to pull the ethmoid wall nearer the septum, which is covered with a mucoperiosteum that performs the physiologic function almost as well as the mucous membrane of the nose.

In my experience if all the infection has been removed, in a few months the new nose apparently is performing its physiologic function, the nasopharynx is comfortable and moist; on the other hand, when the dryness of the nasopharynx has increased it usually means there still remains an infection.

To pack the nose causes pain, congestion of the sinuses and danger of a meningitis. To leave the nose unpacked the patient may bleed, giving both patient and operator trouble. To avoid both of the obstacles, a happy medium is found by packing the posterior nares below the operative field extending forward between the inferior turbinate and septum—which makes it easy to remove (Fig. 3).

The patient is not troubled clearing the nasopharynx or swallowing blood, causing nausea. The operative field is not irritated by packing or prevented from draining forward. Should the bleeding become too free the patient is instructed to hold his nose, which usually stops it.

Is the patient a hospital case? Yes, if it is the only way you can keep him comparatively quiet, which will often prevent the pain from the third to the seventh day.

The writer presupposes that the surgeon who does the radical operation for pansinuitis can easily adopt any of the modified operations for one or more sinuses.

A CASE OF FRONTO-ETHMOIDAL SUPPURATION, RAPIDLY FATAL; AND FOR WHICH THE AUTOPSY FINDINGS WERE NOT CONCLUSIVE.

H. B. YOUNG, A.M., M.D.
BURLINGTON, IOWA.

From the title alone it can be known that this communication is, in the main, the statement of an unsolved problem. It may, however, properly be noted that the presentation has been much longer delayed than was originally intended, due to a peculiar combination of circumstances that will be brought out in the discussion; and it might have been delayed still longer but that the recent study of rhinogenic cerebral abscess by Leegaard seemed to make this the ideal occasion for consideration of this rather unique case.

Mrs. H—, age 33 years, mother of one half grown child, dining room assistant in the hotel where her husband was the porter, presented herself in the afternoon of March 3, 1914, because she had been told by a friend to consult an oculist about the headache which had annoyed her more or less for several weeks, and had recently become very distressing. She considered herself otherwise in good health, and had had no occasion to refer her trouble to the eyes, ears, nose, throat or teeth. The headache was mostly frontal; but it also radiated to the vertex, and was sometimes located back of the ear.

No lesions were discovered in the eyes or ears. They were also normal in function. Nothing unusual was seen in the right naris, but in the left there was a thin streak of pus behind the tumefied middle turbinate. This streak became a copious stream upon shrinkage of the mucosa, and the relief from headache promptly followed. After the usual directions about vaporizing and cleansing, plus a warning that operative interference was more than a possible prospect, she went back to her work. On the following day, about the same hour, she reported continuous comfort until an early hour that morning. Shrinkage again brought the stream, which was augmented by suction with a Brawley pump, and again there was prompt relief. On the afternoon of the 5th, however, the report was not so satisfactory. The headache returned shortly after midnight. Shrinkage and suction brought less discharge; so I strongly advised immediate operation. This was not acceded to because she must first find someone to take her place. Towards midday of the 6th she telephoned that she had had a bad night and would go to the hospital, would notify me of her arrival there, and then I could do what I thought best. The notification did not come until 8 p. m. She then complained of pain in the left arm

and leg, additional to that in the head. A feeling of weakness which she also mentioned might, it seemed, be attributed to the several facts that the catamenia had just appeared, that she had missed the usual bowel movement, and that, without any suggestion of nausea, she had been able to take but little food. Temperature was 100.2, pulse 90, and respiration accelerated in proportion. Under transillumination the right frontal was clear, the left clouded. In the comparatively fair way behind a now slightly swollen turbinate, the streak of pus could still be seen; but suction neither brought the stream nor the customary relief. Ice bags to the forehead and behind the ear were, however, effective in a comparativly short time. Orders for the night were: Calomel, followed by castor oil, and such small doses of morphia hypodermatically as might be needed to get a modicum of rest. Operation by the nasal route was next on the program.

At 7:30 the next morning the nurse telephoned that my patient had just had a convulsive seizure, followed by general rigidity, and although apparently never unconscious was speechless. When I saw her, approximately a half-hour later, the rigidity had mostly passed and she was entirely at ease, judged both by posture and facial expression. I had no trouble in getting her attention; but I could not provoke a single word in response. Then the husband arrived. She gave him one look and burst into tears. But he also failed to get even an attempt at speech. In brief, it was a complete motor aphasia; for she never spoke again, nor did anyone in attendance ever see her try to speak. That she was conscious for another 24 hours seems assured by the fact that during that period she took food naturally and had no involuntary urination. She was also not deaf, because her eyes would turn at once toward the source of any unusual noise. No ocular or other palsy; knee and ankle reflexes normal; slight Babinski on both sides. She had had the calomel but not the castor oil; and no morphia. Under cold applications she had rested sufficiently well, sleeping as much as 2½ hours at a time, to make the latter unnecessary. She was awake at 5 a. m. and then asked for water. During the night the temperature had fallen to 99.4 and pulse to 80. It was now back to the evening record. Under these conditions the proposed nasal operation seemed to be inadequate; and in the consultation which followed, with two surgeons and a pathologist, first consideration went to the possibility of autointoxication from intestinal stasis. To eliminate this, Ol. Tigli was ordered. Five hours later there was free bowel movement. In the meantime the report of the pathologist was as follows: Urinalysis, nothing of note; blood pressure, 130 systolic; blood count, moderate leucocytosis —8600 whites; lumbar puncture, spinal fluid clear, not under distinct pressure, reduced copper solution, (centrifuged) contains a few blood cells, probably caught in puncture, but no bacteria. Suggested urotropin, which was ordered.

During the morning there was free perspiration without rigor. During the afternoon, with pulse and temperature unchanged, the respiration went to 40 with a suggestion of stertor. She took, and retained small portions of liquid nourishment, and slept fairly well that night.

The morning record of the 8th was: Temperature 99.6, pulse 96, and respiration 36. Normal salt by the drop method, per rectum, was given and retained. Nothing of note was recorded until 1:30 p. m., when the temperature went up to 101.6, pulse to 110, and respiration to 50 with in-

creased stertor. In compliance with my request to be called on the appearance of any decided change in conditions, I was notified at 5 p. m. that temperature was 104, that she moaned as again in distress, or pain, and seemed not so conscious. She had also perspired freely again without rigor, and had retained 8 ounces of milk per rectum.

Summoning my consultants, I declared my belief that, in spite of the unusual picture of rhinogenic brain abscess, no other explanation seemed tenable; and that the time had arrived when surgical exploration should not longer be delayed. With their unanimous approval I then did the radical operation. After clearing the frontal and ethmoids of some pus and large granulation masses, I searched in vain for the expected hiatus in the cerebral wall. It remained to make one, practically round, about 7 mm in diameter in the center of the posterior wall. The dura pulsated faintly. We could not say that it bulged, or was really discolored. Through a small crucial incision, three exploratory punctures were made, two with a Bishop shovel-point director, towards the third convolution and just external to the ethmoid wall respectively, and the third between these with an aspirating needle plus suction. No pus presenting, the search was then abandoned. The wound was dressed in the usual way and the patient returned to bed no worse from the handling. In fact, the breathing was less labored and the pulse was steadier. Temperature at 10 p. m., 101.6. In the early hours of the morning, however, there began an upward march of temperature, pulse and respiration, which knew no abatement until the extremes of 107.2, 170, and 66 were reached a few minutes before death at 9 p. m. that day—just 6 days and 6 hours from the first visit to my office. Autopsy 12 hours later. Dura, pia, and arachnoid, alike, not indicative of inflammation; and the base presented nothing unusual. The brain was then cross-sectioned, in thin slices, from before backward throughout. The paths of the exploring instruments were easily traced—all within the limits of safety, but, macroscopically, there was no other spot that could be declared abnormal. The mastoids, sphenoids, and right frontal and ethmoids were then opened in a search for other foci of infection, and none found. There was in evidence only a left fronto-ethmoidal suppuration for which the operation was adequate; and yet the woman, with a preliminary ablation of a characteristic cerebral function, had died as one would die from rupture of an abscess into a ventricle. What was the cause of death? Some profoundly toxic process in the brain; but what was the modus operandi? The microscope could, perhaps, have shown something not visible to the naked eye that would have been a rational answer. But for this the brain should first have been stabilized in formalin. That this was not done is regretable, and that it should always be done is the outstanding lesson.

I have assumed that this case is unique, because, in sketching it to a number of colleagues and asking what should have been found at the autopsy, all but one promptly answered, "brain abscess"; and upon being negatively informed, as promptly admitted that, like myself, they knew of nothing analogous in the literature.

The one who is the exception is to open the discussion.

DISCUSSION OF DRS. LEMERE'S, PRATT'S, REAVES', AND YOUNG'S PAPERS

Dr. Emil Mayer, New York City: I have brought and here present a section of the skull which may help make it clear to you what the reader of the paper had reference to in describing his operation of opening the canine fossa and extending into the nose without destruction or cutting off of a part of the inferior turbinate. As Dr. Lemere had the courtesy to ask me to open the discussion and also to send me the paper before the meeting, I thought I might illustrate it a great deal better with this section of the skull before you.

Dr. Lemere speaks of an infection in the antrum. This is not a chronic purulent affair, as he states, but rather a catarrhal affection with a small amount of pus. One observation he has made pleases me very much for the reason that I think many of us go along and fail to see things that are utterly apparent. I refer to the thickening of the posterior pharyngeal wall. I have seen it a number of times and have always associated it with a condition following any one of the attacks of acute catarrhal rhinitis. It is passed over by ever so many of us because the patient doesn't complain and yet at the same time there is that condition. Dr. Lemere tells us he has gone on further and made an examination of the X-ray sinuses and finds it occurs very frequently in these individuals. He also says that he gets his best results when the head is extended well forward in taking the picture. One of our young men in New York has now made a plate that can be put in the mouth and proposes to show the picture of the sinuses by having the plate taken that way, and he certainly shows a very wonderful picture.

I hesitate to talk very much about the X-ray before the master, our chairman. He has shown us some excellent pictures of the X-ray sinuses. Dr. Lemere speaks of transillumination rather to condemn it. I consider that any man that has not got a transillumination apparatus is not doing good work. It is such a simple thing to have and it is surprising to me how many men allow their patients to go to consultants without having transilluminated them. It is true transillumination gives no positive evidence, neither does a Wassermann, but you do not hesitate to do a Wassermann even if it turns out negative. Why not make the examination? If there is a small amount of pus in the nose and if your transillumination is positive you have a good help. Not only that, it must be a source of chagrin to you to have your patient come back and say, "I went to Cleveland and the first thing the doctor did was to put a light in the mouth; nobody ever did that before." In reading the paper it occurred to me that Dr. Lemere is taking a step quite in advance of what many of us have done. I have always felt that the opening of the canine fossa should be done only where there is no doubt a quantity of pus is present and where other methods have failed. Of course, the danger with a chronic purulent condition would be that there remains a fistulous opening and that disagreeable pus is being constantly mixed with the food which would be a source of more than annoyance. I would like, therefore, to suggest in such early cases the method of puncture with the trocar and clean out the antrum in the following manner: The trocar is introduced under the inferior turbinate with one plunge. A slight amount of local anesthesia is all that is necessary. Attached to the trocar is a piece of rubber tubing: then you have a syringe without any fluid in it. Draw out the piston first, attach it to the tubing, and blow air into the antrum. That will do two things; if there is anything like a quantity of liquid pus it will be very apt to come out alongside the trocar opening, but above all it will teach you that you are in the antrum and not in the face. If in the face there will be a slight edema and you will not go any further. On the other

hand, if you inject water there you will have many disagreeable weeks of discomfort with the patient going around with a tremendous amount of swelling. I speak of this for the reason that we are here to learn if we can from each other and to impart what little we may know and to make suggestions for the future so we may find out if the methods suggested are of value.

The resumé then of the paper of my friend and former pupil, is that he has presented us with an entirely new point of view in that we are to bear in mind when we examine these patients with hypertrophy back of the posterior pillar of the tonsil, we will also find associated with it a certain amount of disease of the antrum of Highmore and that we may be able to produce a cure of these conditions by intranasal treatment.

One word, in closing: wherever I have performed the operation of opening the canine fossa I have not been able to send my patients from the hospital in four days ready to close up the external wound. In every instance there has been a great deal of swelling and thickness of the fatty parts of the cheek which have remained more than a fortnight before disappearing. Perhaps I have performed this operation in patients with well marked purulent conditions, Dr. Lemere's having been more of a catarrhal or mucopurulent condition.

Dr. J. C. Beck, Chicago: Just one word on the paper of Dr. Lemere. I was glad to hear him say he uses the electric burr for opening the anterior wall, which has been my custom for some time. I would like to ask why he doesn't go into the nose with the burr without any danger: in fact, he may preserve some of the nasal wall mucous membrane which may be utilized to cover over the lower edge. Another thing, I do not think we are justified in accepting one method of opening the antrum. I spoke yesterday of a case in which transillumination was negative but X-ray positive, and on opening the antrum I found only a thickened membrane.

Referring to Dr. Reaves' paper, I am always pleased to see this gentleman present a paper—the Academy had a man in Dr. Pynchon who made instruments to help us a great deal in doing the work. Dr. Reaves, I believe, is a man equal to suggesting excellent instruments: they are small, like the instrument we like to use in the nose. I still use the scissors in amputation of the middle turbinate. I would use the Reaves' knife myself, but the first one was no good, but he improved on it. In reference to the position, that is the correct thing, the patient is lying down, but many times in the reclining position the turbinate slips down so we anchor it with a Michel clip and thread. As to anesthesia he mentioned cocain, but not the percentage. I believe most of you who use pure cocain rubbed on the surface will get ample anesthesia. I have no difficulty. However, there is no objection to injecting the regions of the nerves.

He mentions the point of time. No one is in a great hurry and yet you may have a patient who has something to say about it. You want to get through if you are busy. The question of mucoperiosteum granulation interested me very much. At the Detroit meeting of the American Medical Association I called attention to the fact that this granulation would often defeat the operation about the frontal sinus outlet. It will finally close. At least one part should be left uninjured.

I do not know that I can say anything more about the technic of the operation; he described it so fully and it can be seen how good it is. I like the idea brought out by Dr. Pratt and the essayist in reference to the mucoperichondrium. Of course, they are all operated in the hospital; we never pack our sinus operations, at least I do not. Dr. Young's case was interesting: the absence of any postmortem finding with men-

ingial trouble—there should have been some found and it certainly ought to go on record. What did the postmortem show from the head down? Nothing was said about the kidneys.

Dr. H. S. Gradle, Chicago: Dr. Young mentioned this case to me some time ago and I had seen a similar case in Prague. The brain was as negative as in Dr. Young's case and it was called a toxemia of the pons, in the absence of anything better. Personally I thought it was a general septicemia. The autopsy failed to show anything from the neck down and we have to assume from the character of the temperature, the pulse, and the respiration, that there was an extreme toxemia, purely due to a septic process elsewhere in the body. The diagnosis was made by Prof. Elschnig. As I say, I have no license to discuss this paper, only to add a case which I had seen.

Dr. Brown: I was interested to hear about the value of the X-ray in antrum diseases. Along early in June I had the case of a man who developed arthritis involving the wrist, ankle, and knee joints. Six weeks ago the case was referred to me. Examination of the nose showed ethmoiditis. I did an ethmoidectomy without any improvement in the arthritis. This man had absolutely no symptom of antrum disease, no headache, no pain, no tenderness over the antrum and an examination for discharge from the nose would not lead to a diagnosis of antrum disease, but the man was not improving, so I had to do something. I had an X-ray taken which showed a cloudy antrum. About eight days ago I did a needle puncture and the antrum was full of whitish pus with a foul odor. Two days later the man remarked that he felt much better, the joints were less tender and the pain and swelling were subsiding. During the coming week I intend to do an antrum operation and expect him to recover from the arthritis. This case is interesting to me because it does show the value of the X-ray and it also proves the fact that we can always make a diagnosis of the disease by first knowing the symptoms.

Dr. H. V. Dutrow, Dayton, O.: I feel that Dr. Lemere is to be congratulated upon the first point in his paper regarding the use of the X-ray in maxillary sinus disease. There is one instrument that can be used in practically every suspicious case of sinus disease, and that is the transilluminator. If with the use of this instrument you find both sinuses clear, it is reasonable to assume that you have no trouble. Of course Dr. Beck's case was an exception. If with your transilluminator there is the slightest indication of a diminution of your illumination on one or both sides, the X-ray should be used. The condition of the nose makes very little difference, it may be absolutely free of pus and also the nasal pharynx, yet at the same time you may have to deal with an infected sinus. I cannot agree with him in his operative procedure. I feel that his operative procedure might be practical in very acute cases such as we very often find following an apical abscess, but I do not believe that we should sacrifice the possibility of a good end result to save the patient a slight degree of additional shock, especially in the old cases of maxillary sinuitis. If you make your opening large enough so that you can see well into the sinus, you will very often see granulations sticking around in all of the angles, especially in the extension into the concavity of the inner surface of the malar bone. If you leave any part of this granulation you will very likely have to do a second or third operation. I recently operated two cases that had been operated previously and I feel that this was the cause for additional operative interference. The opening into the nose should be very carefully and accurately made so that it will remain open at all times and permit of free drainage and ventilation of the sinus. To make this opening properly requires considerable time and to my mind is one of the most important steps of the operation.

Dr. Hal. Foster, Kansas City, Mo.: Dr. Pratt is to be congratulated on his paper. He has called our attention to the necessity of being clean and doing sterile operations upon the ethmoid, also the ease and simplicity of ethmoid operations, when one is familiar with these parts. The doctor is eminently correct when he said that the turbinates should never be removed, unless it is badly broken down by polypoid degeneration. I wish to emphasize that remark with all of the force at my command. I well know that legions of turbinate bones have been slaughtered and massacred in doing this operation, when the operator, as Dr. Pratt correctly stated, could have entered the ethmoid under the turbinate and left this all important nasal bone to perform its normal physiologic function of drying, sifting and warming the air on its journey to the lungs. If one will stop to think, he will hesitate a long time before removing it. Patients five years later, and in many cases one year, will have scabs in their noses and complain of dry throats, which is exceedingly unpleasant and annoying. With Sluder's sinus knives and Mosher's curets the operation can be done entering the turbinate as Dr. Pratt stated, without doing any damage to the nose and with the certainty of a cured, happy and grateful patient, which after all, should be the aim of every rhinologist.

I congratulate Dr. Pratt and consider his paper a timely one. Every operator should be directed by it in doing an ethmoid operation, and in so doing he will anchor in the port of safety.

Dr. Robert Sonnenschein, Chicago, asked how the essayist enters the sphenoid sinus and removes the anterior wall without first removing the middle turbinate body, in view of the fact that the posterior end of the middle turbinate usually covers a considerable portion of the anterior sphenoid wall.

Dr. B. N. Colver, Battle Creek, Mich.: I am very much interested in this paper. The methods advocated by Mosher and Faulkner of complete exenteration of the ethmoid cells is, in my opinion, too radical in many cases, or without a previous thorough trial of less radical measures. Conservation of the middle turbinates is to be desired, if possible. What does Dr. Pratt do in cases that have a so-called cystic (cellular) turbinate? I would like to mention a procedure which I have used a considerable number of times and an interesting case which illustrates its value.

Where a middle turbinate is determined to be cystic, and is obstructive, either to a proper placement of the septum after a submucous resection or to the drainage of the cells underlying, it is desirable to reduce its bulk or to remove its anterior end. Instead of removing the anterior quarter or third, the turbinate is split and the lateral half removed as far back as the cell extends within its mass. This is accomplished by puncturing the turbinal cell with a septal knife and with scissors cutting along the lower border of the turbinate until the posterior end of the cell is reached. Then with the scissors the upper border of the cell is split and the lateral shell removed by cutting just back of the posterior cell wall. This usually reduces the bulk of the turbinate to less than a third of its original thickness without materially reducing the mucous membrane surface and with a minimum of surgical wound. By now infracting the turbinate and in some cases removing the uncinate process, the functional value of the turbinate may be maintained, the obstructive interference relieved and the turbinate symmetrically placed in the nose. Such a procedure results in marked relief of anterior ethmoid obstruction and gradual improvement of symptoms.

A woman came complaining of asthma of two months' duration. A couple of polypi presented leading to the suspicion of ethmoiditis. The X-ray examination was negative. The removal of these polypi led to the discovery of a third one higher up. In tracing the pedicle of the polyp,

the turbinate was found to be shaped something like a gourd. The tail of the pedicle was seen to disappear just over the little angle between the cell (turbinal) below and the thin portion of the turbinate above. It was evident that the polyp originated from the cell within the turbinate itself. On opening, the cell was found to be filled with creamy pus and edematous and polypoid mucous membrane. Inspection of the other anterior ethmoid cells revealing nothing pathologic, no further work was done. In this case the asthma cleared up in the course of a couple of weeks.

I believe that this procedure in operating cases of obstructing or infected cystic turbinate is well worth doing, as a first measure at least, without the radical obliteration of the ethmoid cells.

Dr. Herman Jarecky, New York City: With all due reverence to the X-ray do not rely entirely upon it. I had an interesting case sent to me and the family physician, who was an extremely bright individual, had an X-ray taken which showed a cloudy antrum on the right side. The patient was unable to breathe freely. After being in practice a long time some things come to you intuitively. A Wassermann was positive and antisyphilitic treatment cleared up the case. I have been using a chisel to open the canine fossa and find no trouble going in there. From your resonance you can tell that you have a cavity. In opening this cavity I make a large enough opening and, following up what the previous doctor spoke about, I use a small electric light in case I am in doubt about anything. Occasionally there is an absence of the orbital plate and you will find this is not a serious condition.

As regards leaving a fistulous tract there after the operation, I am in the habit of closing the opening in a few days and have never had any trouble in that respect. Repeated punctures that Dr. Mayer spoke about have another effect than washing out the antrum, because you give repeated drainage, and if you make a puncture here and later on make another puncture you have your washing out from the opening you have made previously. Of course, if you go through repeatedly you do not always have the same drainage.

Speaking about puncture into the cheek, I had a patient with partial facial paralysis in which case the doctor had failed to get into the antrum. Another suggestion I would like to make is, don't send your patient to your X-ray man after irrigation. That suggestion is, I think, obvious.

Dr. Jos. D. Heitger, Louisville, Ky: I wish to lay stress on one point. In a great many obscure cases we can profit most in making our final diagnosis from one thing and that is to enter the puncture and wash it out.

I have a little thing to present for your consideration in the matter of making cultures from the inside of the antrum. (Illustrates on the blackboard.)

Dr. E. H. Parker, Minneapolis, Minn.: I wish to congratulate Dr. Lemere on his paper in general but particularly on his remarks on latent antrum cases, a class of cases that is so frequently unrecognized. Some of us call them by different names. I prefer to classify them under "recurrent antrum suppuration."

I differ from Dr. Lemere somewhat in regard to transillumination: I think it is of the greatest help to a rhinologist to use routine transillumination with a small lamp, with a proper rheostat.

A chronic antrum always transilluminates dark. It is especially in the latent or recurrent cases we get the most help from transillumination; a slight difference on the two sides which varies in degree at different times is of great diagnostic value. Transillumination is not perceptibly affected by the content of the antrum but has to do with the changes in the

mucous membrane or deeper tissues. About ten years ago an acute antrum case of less than twenty-four hours' duration came into my office. Examination showed clear and equal transillumination. Irrigation showed mocopus. Two days later when irrigation was negative, the transillumination was dark.

In any suspected antrum case, such as frequent colds, a one-sided cold, a history of yellow discharge, if we find by lowering the rheostat that one antrum gets dark sooner than the other, we make a presumptive diagnosis. If then we instruct the patient on how to make the proper observations they come in later with a typical case of acute antrum disease.

In nearly all recurrent antrum cases dental pathology is the cause. In all antrum infections, I think, we should assume the dental cause until we can prove it otherwise.

Dr. Sidney Israel, Houston, Texas—The pharyngoscope invented by the late Dr. Holmes is useful in exploring practically the entire mucosal lining of the maxillary antrum before operation. Study the mucous membrane and interior of the antrum as it exists prior to and after the radical operation, as the urologist would study the interior of the bladder with the cystoscope.

Dr. S. S. Burns, St. Louis, Mo.: I had one experience with a patient collapsing after washing out the antrum. It was six or eight hours before we could get him home. And in the practice of Dr. Sauer, a man who had had his antrum washed out several times before, collapsed and was kept in the hospital four or five days.

Dr. J. M. Ingersoll, Cleveland, Ohio: In regard to determining whether or not the trocar is in the antrum, one of the methods we use is to have a silver probe, smaller than the trocar, and when the trocar is supposedly in the antrum pass the probe through the trocar. If it goes through the trocar it certainly passes into some cavity or cyst. This is positive evidence that the trocar is in the cavity.

In regard to opening the maxillary sinus through the canine fossa, I have seen a great many foreign bodies in these sinuses recently and in these cases there was no choice as to where the sinus should be opened. After the foreign bodies were removed through the canine fossa and a large opening made into the nose they all cleared up very quickly and this made me think more and more that the canine fossa is the proper method of approach in chronic cases.

I differ from one of the speakers in regard to the removal of all of the lining membrane. I think it is a mistake to curet the membrane of the antrum. Polypoid masses and granulation tissue should be removed and then the lining membrane of the cavity carefully wiped off with a small sponge, in this way removing any small masses of granulation tissue but leaving the membrane covering the bony walls. In making the opening from the antrum into the nose I use the chisel, leaving the nasal mucous membrane as a flap, attached at its base and reflected over into the antrum.

It naturally pleases me to have any one discuss the radiographs for I am very much interested in them. I think sometimes we fail in the proper interpretation of the X-rays and also of the results of transillumination, because we see, for instance, a dark antrum on transillumination and the X-ray picture also shows the same condition, yet we do not, when we make an experimental puncture, get pus. We must remember that the antra may be free from pus, but the mucous membrane is inflamed and thickened and this may produce a shadow either on transillumination or in the X-ray. In the X-ray picture we must remember that the condition of the antrum and the condition of the surrounding bones have some influence on the shadow.

Dr. Lemere (closing discussion): I wish to express my thanks for the kindly tone expressed in the discussion of this paper. I expected some criticism of the facts stated. I am deeply convinced that they are correct and the conclusions warranted.

In the discussion there was some misunderstanding as to the nature of the condition under consideration. The diagnosis and operative procedures are intended for latent antrum disease and may not apply to pronounced purulent or necrotic conditions. The two main objects of the technic are to secure constant irrigation after the operation, and to leave a permanent opening from the antrum into the inferior fossa of the nose.

I would again emphasize the fact that the pathology in these cases is often as Dr. Beck has stated,—the mucous membrane is diseased and the underlying bone often so changed as to be decalcified. This pathology of the mucous membrane and the bone is characteristic, there is often no pus demonstrable macroscopically on opening the antrum.

Dr. Pratt (closing discussion): In reference to the first question, you will find by looking at the specimen I passed around, that the posterior wall of the ethmoid occupies about three-fifths of the anterior wall of the sphenoid. You go right through there and you can go nowhere else, except into the sphenoid. In reference to the cystic middle turbinate, I go in and break down the inside part and bite out the wall back of the ethmoid. As the cyst is lined with membrane, this leaves the remaining part of the middle turbinate entirely covered with membrane and by breaking the turbinate over, it lies in the normal position. Later you correct the deflection of the septum. In a very short time you will hardly know the nose has been operated at all.

Dr. W. P. Reaves (closing discussion): In regard to point raised by Dr. Beck—cocain anesthesia, why use novocain? I have always used cocain, but have found cases where the tissues were highly inflamed or congested, anesthesia was hard to get and maintain, requiring more cocain for anesthesia than usual, plus the pain. The two conditions may cause shock. After the operation is begun and is painful it is hard to recocainize a bleeding field. Recently these conditions have been overcome by injecting novocain before beginning the operation, as indicated in the paper, which reduces the amount of cocain, gives quicker anesthesia, lasts longer, a time saver, better and safer.

Dr. Young (closing discussion): It is due to one of my colleagues who is an artist in postmortem work, to say that I did not make the autopsy,—turned it over to him. In my first conversation with Dr. Gradle, I understood, although he omitted saying it here, that the autopsy he saw in Prag was that of Dr. Elschnig's second case of this character, and no others of record. The war blocked any attempt to communicate with Dr. Elschnig as I prepared to do. The last sentence of my report, "no brain sectioned until stabilized by formalin," should go without saying. For if there is a fatal toxemia of the nucleus of the pons, without meningitis or abscess, it seems not unlikely that the intima of the vessels would be altered accordingly. I also wish to reiterate what Dr. Pollock said about sitting down afterwards and thinking of other things that might have been done.

EXHIBITION OF NEW INSTRUMENTS
NEW TONSILLOTOME

T. E. Carmody, M. D.
DENVER, COLO.

I have an instrument here which one of our younger men in Denver has devised, which I think is an improvement on the Sluder. It has a handle like the Sluder and a trigger that will draw down the wire. It can easily be held and the wire in coming down doesn't collapse completely because we have a round portion here, and it can be pulled back and forth without breaking much easier than the other snares. There are also some reprints describing it, by Dr. Baum. I have used this instrument a few times myself and like it very much. This would be very good to start out with and I am sure you would like it better than the Sluder if you continued with it.

TRANSACTIONS

OF THE

TWENTY-FOURTH ANNUAL MEETING

OF THE

American Academy of Ophthalmology and Oto-Laryngology

NECROLOGY
MINUTES
HONOR ROLL
LIST OF MEMBERS

HELD AT
CLEVELAND, O.
OCTOBER 16, 17, 18, 1919

Requiescat in Pace

DR. JOHN R. FLETCHER

DR. S. G. KELLEY

DR. SAMUEL C. NORRIS

DR. J. M. RAY

DR. A. R. REEVE

DR. ERNEST H. ROWE

DR. SAMUEL G. TODD

On Thursday morning, October 16th, 1919, at Hotel Statler, the meeting was called to order at 9:30.

THE PRESIDENT: Gentlemen of the Academy, I thank you for the honor you have conferred upon me in making me your president. I hope that this meeting will be successful. The success of our meeting will reflect credit on our secretary and upon the local members of the committee rather than upon myself individually. We have endeavored to make the arrangements complete. Unfortunately, some lapses occur. The meeting is now open, and the order of business calls for the reading of the minutes first.

DR. TEAL, Lincoln, Neb.: I move that the reading of the minutes be dispensed with. Motion seconded and carried.

REPORT OF SECRETARY

October 16, 1919.

Mr. President and Fellows of the American Academy of Ophthalmology and Oto-Laryngology:

Although the late war was the absorbing occupation of the country for several years past and the Academy contributed its full share of men to the great cause, those whose misfortune it was to remain at home kept the wheels of the Academy moving. One hundred and four of the Fellows registered for the twenty-third annual meeting in Denver last August, in spite of the difficulties of travel, the uncertainty for a time as to whether or not the meeting would be held, and the great number of men in military service. That this body of men geographically distributed over all parts of the United States and Canada, should be able to convene in a successful session during this war period, notwithstanding all the difficulties, is a source of satisfaction and a tribute to the stability and thoroughness of the organization of the Academy.

Numerically, and, I am sure, scientifically, we are in the ascendancy. Fifty-four names were added to our membership roll at Denver, making a total now of eleven hundred and fifty-four. During the year 1919, we lost three by resignations, and seven were claimed by death. They are Drs. J. R. Fletcher, S. G. Kelly, S. A. Norris, J. M. Ray, R. A. Reeve, E. H. Rowe and

S. G. Todd. Dr. John M. Ray was President of the Academy in 1914 at our Boston meeting, and was known to all as one of the men earnestly devoted to the interests of the Academy. Dr. R. A. Reeve, one of our well-known Canadian confreres, served as First Vice-President in 1907 at the meeting in Louisville. He was always in attendance at the meetings, and devoted to the Academy. All who knew Dr. Reeve will remember him as a "gentleman of the old school," a man of culture and refinement, a distinguished ophthalmologist and a most sincere and enthusiastic advocate of all that is highest and noblest in medicine.

We have records of one hundred and ninety-six Fellows who entered the United States Military Service up to October 19, 1918. In order to have a complete record, we are asking that those who were in the service will communicate with the Secretary, giving their military rank and title.

A list of names has been posted of Fellows, about whom we are seeking information. Letters to them have been returned and the Transactions have remained unclaimed. If any of those present can furnish the information desired, we will be greatly indebted to them.

The list of candidates for membership has also been posted. As the By-Laws require that the name of each candidate must be posted for at least one day, it will be necessary to have all names in on Friday morning. It is the duty of the Fellows to carefully scan this list, and any information which you may have which will help the Membership Committee to pass intelligently upon qualifications or disqualifications of a candidate, should be communicated to a member of the Council.

Several abstracts are omitted in the program. In order to get the programs from the press in time to reach the Fellows before the meeting, all abstracts should be in the Committee's hands a minimum of five weeks before the meeting. A better balanced program can be presented if an abstract of each paper is sent in with the title.

Respectfully submitted,

(Signed) LUTHER C. PETER.

October 16, 1919.

On motion of a Fellow, duly supported, same was ordered accepted and spread upon the minutes.

REPORT OF TREASURER, DR. LARGE

Statement for Year Ending October 10, 1919.

Balance on hand from 1918—Cash		$ 6,215.30
	Liberty Bonds	4,000.00
		$10,215.30
Receipts for 1919		6,022.29
		$16,237.59
Disbursements for 1919		3,397.70
Balance		$12,839.89
Cash in bank		$ 5,839.89
Liberty Bonds		7,000.00
Total		$12,839.89

On motion this report was submitted to an auditing committee. THE CHAIR appointed as Auditing Committee, Drs. Jos. C. Beck and T. E. Carmody.

THE CHAIR: It has been suggested that a time be appointed later when we may have a report of the Necrologist.

Unfinished business: None.

New business:

DR. JACKSON: I have the following resolution:

Resolved, That three Fellows of this Academy be appointed to act with appointees already named for this purpose by the Section on Ophthalmology of the American Medical Association and the American Ophthalmologic Society, as a Committee on Invitation, Organization and Arrangements for a World Congress of Ophthalmology to be held in this country at the earliest date found practicable.

DR. GREENWOOD: A resolution was adopted at a meeting of the Council with reference to a matter which should come before the entire body of this Academy. The desire on the part of the Council is that the society authorize that the dues be raised to Ten Dollars. The Treasurer has reported to you that we have a considerable fund already. The idea of the new fund would be to use the income from that, or possibly a portion of the amount sent in in annual dues for an establishment in the nature of a scholarship—not exactly that, but rather the employment of a pathologist or research worker to work out problems on the scientific side of Ophthalmology and Oto-Laryngology. Various suggestions have been made as to where that person should work and what he should do. That will be left to the Council. The question is whether you wish to help along in a scheme of that

kind by having your dues raised from five to ten dollars a year for the next few years.

THE CHAIR: This recommendation is before you for consideration.

DR. GREENWOOD: The idea is to increase the present fund until it has reached the sum of $25,000, and then to use the income from that fund for advancing the scientific side of our specialties.

On motion of Dr. Emerson, properly seconded, the resolution was adopted.

Announcements regarding the entertainment of the visitors and members were made by Dr. Bruner.

The Scientific program was then taken up. (See Pgs. 1 to 397.)

Dr. Greenwood's paper on "The Role Taken by Members of the Academy in the World's War" included a list of those in the service with a record of their work therein. On motion of Dr. Emerson, duly supported, it was ordered that same be included in the Transactions. (See Page 414.)

FRIDAY MORNING, OCT. 17

Called to order at 9:50 A. M., President Ingersoll presiding.

REPORT OF COUNCIL.

DR. GREENWOOD: The Council recommends that the place and date of future meetings shall be fixed by the Council at each annual meeting for the next succeeding meeting.

2. The Council recommends that an alphabetical membership list be printed in the Transactions and a geographical list be printed at a minimum cost, i. e., either in a bound booklet form or with the Transactions.

NOMINATIONS OF OFFICERS FOR 1920

President—Dr. Lee M. Francis, of Buffalo.
First Vice-President—Dr. Hal Foster, of Kansas City.
Second Vice-President—Dr. W. E. Bruner, of Cleveland.
Third Vice-President—Dr. Robt. C. Lynch, New Orleans.

Treasurer—Dr. S. H. Large, Cleveland.

Secretary—Dr. Luther C. Peter, Philadelphia.

Editor—Dr. Clarence Loeb, Chicago.

Members of Council—Dr. W. P. Wherry, of Omaha; Dr. H. S. Gradle, Chicago.

Committee on Exhibit—Dr. Jos. Lichtenberg, Kansas City.

National Board of Ophthalmic Examiners—Dr. W. H. Wilder, Chicago.

Instead of a formal report of the Necrologist, Dr. Beck has suggested that at the end of the meeting this noon, the men get together in an informal way, and the intimate friends and neighbors of our deceased members talk over and tell little incidents they know and formulate some report in regard to our deceased friends.

RECOMMENDATION FOR POSTGRADUATE INSTRUCTION

DR. BECK: (1) A standardized curriculum extending over a period of two years, to be given in a Class A University. The details of the curriculum to be the same as those recommended by the committees on education of the American Laryngologic and the American Laryngologic, Rhinologic and Otologic Associations, which provide for didactic and clinical instruction in anatomy, physiology and pathology, covering a period of six months, followed by an internship in a special hospital, or a hospital in which the nose, throat and ear department will furnish the necessary training.

(2) A comprehensive examination on completing the course.

(3) The conferring of a special degree by the University where the course is taken.

(Signed) JOS. C. BECK, *Chairman;*
T. E. CARMODY,
J. M. INGERSOLL.

THE CHAIR: The committee has had the intention to recommend something practical, along the same lines that the ophthalmologic section has adopted as requirement for membership in the Academy.

REPORT ON COMFORT FUND

Dr. S. H. Large, Treasurer, Cleveland, Ohio

Memphis, Tenn., Oct. 13, 1919.

Dear Sir:

In August, 1918, U. S. A. Base Hospital No. 115 received

from Dr. John R. Newcomb a check for $1,272.00, which sum had been subscribed by members of the American Academy of Ophthalmology and Oto-Laryngology as a Comfort Fund for that organization. On behalf of the personnel of the Hospital, I wish to thank the members of the Academy for this fund, which was expended under the direction of a committee composed of members of the Academy, namely, Drs. Norval H. Pierce, Lee M. Francis, Harvey B. Searcy and E. C. Ellett. A statement of these expenditures is attached. In some instances receipts were not obtained, and in others they were lost in the mail, so that the report is not complete. The following is a list of the amounts spent:

Check book	2.60	Francs
Printing	463.05	
Rubber stamps	225.80	
Entertainment	769.37	
Miss Sheehan, Chief Nurse, for nurses	1,000.00	
Nurses' Memorial	75.00	
Service stripes (nurses)	300.00	
Office supplies	102.95	
Traveling expenses	91.00	
Locks	3.20	
Glass	39.00	
Instruments	28.60	
Capt. Francis	1,500.00	
Cables	50.00	
	4,560.00	
At 5.55, the rate of exchange at which the fund was exchanged, this amounts to	821.72	Dollars
Printing history	323.34	
	1,145.06	
Balance	126.94	
	1,272.00	

While on deposit in this country the fund earned interest amounting to $.41, which makes a total balance of $127.35, for which my check is enclosed. Here are also attached such receipts and other papers pertaining to the fund as are on hand.

Dr. Lee M. Francis was active in having established in Paris certain courses in Head Surgery, given by the French, which were attended by a number of American officers. The other members of the committee took pleasure in contributing from this fund to Dr. Francis' expenses in connection with this work,

hoping that thereby the Academy and Base Hospital No. 115 would share in the credit for this excellent piece of work which Dr. Francis initiated and pushed to a successful conclusion.

Among other items that might need explanation are the following: One of the nurses attached to No. 115, and one attached to another hospital, died in France. A citizen of Vichy offered to erect a small memorial over their grave if we would arrange to pay for cost of materials, which we were glad to share with the other hospital concerned, and it was paid from this fund. A deficit for the Christmas entertainment given for the officers, nurses and men of No. 115 was also paid from this fund. A total of 1,000 francs was given the Chief Nurse at different times for the benefit of the nurses, to be spent as she saw fit. When the nurses were ordered home, the vicissitudes of travel made it advisable to send an officer with them to the port, and his expenses were paid from the fund, as well as the expenses of an enlisted man on a trip for some records. The items of printing, rubber stamps, office supplies, etc., were for items which were part of the equipment of the Hospital, but which did not reach us, and there was no readily available means to supply these small deficiencies except to get them from the fund.

To those who contributed to the fund we would like again to express our thanks, and to say that this money was of the greatest possible assistance to us on many occasions.

Repectfully submitted,

(Signed) EDWARD C. ELLETT,
Formerly commanding Base Hospital No. 115.

It was moved by Dr. Howe, seconded and carried, that a committee be appointed to represent the Academy at an International Congress of Ophthalmologists which is to meet in this country in the coming year.

THE CHAIR: The names suggested for that committee are Drs. Edw. Jackson, Luther C. Peter and W. B. Lancaster.

On motion of Dr. Lewis duly supported, these appointments were appoved.

DR. LUCIEN HOWE presented the following resolution:

WHEREAS, It is generally conceded that progress in Medicine and Surgery is promoted most effectually by laboratory research work; and

WHEREAS, Various economic and other conditions now combine to produce unnecessary duplication of such work and to hinder what might be accomplished; and

WHEREAS, Experience has shown that if a research laboratory on a large scale were established, similar to the small one

that existed during the war at Mineola, such an institution could become a potent factor for the solution of many problems relating to the physical needs of aviators, to the health of soldiers, sailors and of every citizen; therefore,

Resolved. That a committee of three be appointed by the President of this Academy, with power to increase their number, and they be instructed to report at some subsequent meeting, what recommendations, if any, this Academy should make, with the view to the establishment of such a National Medical Research Laboratory.

DR. LANCASTER: I would second this resolution. My experience at this laboratory convinces me more than my previous experience of the value of a research laboratory. The trouble is not that we are not interested in research, but have had no opportunity to follow these subjects in that way. I hope something may come from this resolution. It will, of course, go to the Council and be considered by them and reported back to the Academy at the next general meeting.

Business session adjourned.

SATURDAY MORNING, OCT. 18

Business session of Academy called to order at 9:50, President Ingersoll presiding.

The list of nominations previously reported by the Council was read.

On motion of Dr. Suker, duly supported, the Secretary cast the ballot of the Academy, and the candidates named were declared duly elected.

THE CHAIR: The next meeting will be the twenty-fifth annual meeting, and will be held in Kansas City, where the first meeting was held. The dates will be October 14, 15 and 16. It is hardly necessary for me to say that Kansas City has been planning for this. It was suggested two or three years ago. It is hoped that all those here will come and bring someone with them and make this meeting better than any before. Incidentally I wish to thank you for the spirit you have shown and the support you have given me in helping make this meeting what it has been.

The Council has recommended for the Board of National Examiners Wm. H. Wilder, Chicago.

The Auditing Committee, Dr. Beck and Dr. Carmody, re-

ported that the books of the Treasurer had been examined and found correct.

On motion of Dr. Green the Treasurer's report was accepted and ordered placed on file.

The Secretary read the resolution presented by Dr. Howe on Friday morning, stating that the Council had appointed as this committee Drs. Howe, Heckel and Mayer, which committee will report to the Academy at the next annual meeting.

The Commitee on the International Congress of Ophthalmology, which will meet in this country some time within the coming year, consists of Dr. Jackson, Dr. Peter and Dr. Lancaster.

The Council has talked about the desirability of incorporating the society, and in order that we might have something definite in regard to the matter, the following committee was appointed, to report next year on the desirability of incorporation: Drs. Heckel, Peter and Dayton.

The Secretary read the names of one hundred twenty applicants for membership who had been approved by the Council.

On motion of Dr. Suker, duly supported, the Secretary was instructed by the Chair to cast the ballot of the Academy for the list as reported. Those named were declared elected to full membership in the Academy.

Dr. Dayton: As I understand it, the idea of the proposed increased dues is to increase the resources of the Academy that we may be able to carry out original research or establish a chair in some reputable laboratory whereby original research might be made along certain lines. This can easily be done after we have accumulated about as much more as we already have in the treasury, and it will not take very many years to do that, as our membership is increasing and those members are standing fast that already belong. We have now something like 1,350, and with $10 annual dues it will be very easy to accumulate in a short time the amount necessary to place at interest that which will yield us enough income to pay at least $1,500 to some young man who wants to go to work on some line of research pertaining to any one of our specialties. Any young man who has an idea to look up, which looks good to the Council, will have an opportunity of being placed in a laboratory of some reputable college where he can work out his idea and report to this Academy. The Academy will gain its reward in this valuable new research.

Dr. Greenwood: I want to add to the remarks made that the Council this year has already voted a sum, not to exceed $500, for research work, so that we can at once begin to reap the

benefits of this increase in dues. I might also add that under the present dues the cost of running the Academy was eating into our fund.

THE CHAIR: A committee has been doing some work on the investigation of the *Etiology of Iritis*. The war broke into all work of this sort and this committee has been dissolved by mutual consent. The Council has appointed the following as a new committee: Dr. Finnoff, Dr. Benedict and Dr. Green. Dr. Green was one of the former members, and he remains on the committee, at least temporarily, to bind the two committees together and carry on the work, and a sum not to exceed $500 may be used by this committee for any research work which the Council will approve, and thereby encourage the work.

DR. E. MAYER: It so happens that our Secretary arranges the program. Papers are read out of the regular sequence; discussions are then held on these same papers, and the same men say the same thing on the second day they have said on the first. I, therefore, present a resolution to be referred to the Council:

Resolved, That no paper be read out of its sequence on the program, except by unanimous consent.

2. That there be no discussion if there is another paper on the same general subject on the program.

Courtesy must be extended to a man who must hurry home, but it is a bad idea to have our Transactions in bad form.

DR. CLARENCE LOEB: As Editor of the Transactions last year I certify that this is true. Some discussions were so mixed up it was impossible to tell which paper was being discussed. I would like to make two recommendations to the members: that you, when you get your typewritten discussions, look them over at once, make the corrections and return as soon as possible. And second, when you receive the proof, look over that and make corrections and return as soon as possible. Please do not make corrections of new matter on your proof. Make any corrections you wish to make on the typewritten discussion; but it complicates things considerably if there is new matter added to the proof.

THE CHAIRS The motion as Dr. Mayer read, is that if a man's paper is advanced by unanimous consent, it shall be published without discussion, in order that the Transactions may be legible.

This motion was seconded and carried.

DR. GREEN: One of our former presidents, and I believe a charter member of this Academy, is and has been seriously ill for

more than a year. I refer to Dr. Adolph Alt. I move that the Academy extend to him the Academy's greetings and hopes for his speedy recovery.

The motion was seconded and carried.

On motion of Dr. Suker, duly supported, it was ordered that roses be sent to Dr. Alt also.

DR. LOEB: There are a number of copies of the Transactions on hand, some of previous years, some in the hands of the Secretary and some in the hands of the printers. These copies should be collected and stored in one place. I made that suggestion to the Council. No one is to blame for this; it is merely a condition that exists.

DR. GREENWOOD: I do not think it necessary for the Council to take action. I move that the Editor be authorized to collect the volumes of the Transactions, wherever he may find them.

Motion seconded.

DR. SUKER: I have all the Transactions. There are no extra copies in the American Medical Association office, and volumes prior to 1914 are not to be had. I have them all.

The National Libraries have the Transactions on file up to 1914 complete. The first volumes were burned and it was not customary to send them.

DR. GREENWOOD: It would be well to include in the resolution that copies of the Transactions be sent at least to the Surgeon General's office and the American Medical Association and to all the medical libraries. I thought it had been customary to do that.

DR. LOEB: They were not so sent last year. One or two requests were made, which were supplied. Unfortunately, I live in a small apartment and I have no room to store them at my office or apartment, and there should be some provision made for their storage.

DR. HOWE: These Transactions of course are valuable as books. They are practically useless as records, for the reason that they have no indices.

THE CHAIR: It has been moved and seconded that the Editor get together the Transactions, in so far as possible, and that in the future a copy of our Transactions be sent to the medical libraries and National Libraries in Washington.

The motion was carried.

DR. HOWE: I move that our Editor be empowered to have an index made of the Transactions of the subjects and the names,

at an expense of not to exceed $50, and published in the volume to cover the 25 years.

THE CHAIR: And may I suggest that you add that it be added to every five years.

A MEMBER: I second that, with the provision that it be published in the present volume.

DR. LOEB: I do not like to object, but we passed a resolution in the first place that we are going to publish a list of members and a geographical list, and a list of men in the army, and then with an index it would be very bulky; and next year, being the 25th meeting, I think it would be proper to make it then.

DR. GRADLE: I offer an amendment that the index include the first twenty-five years of volumes.

The amendment was seconded and carried.

The original motion was also carried.

REPORT OF COMMITTEE ON POSTGRADUATE EDUCATION IN OTO-LARYNGOLOGICAL SECTIONS

DR. CARMODY: This was approved in the Section:

Your Committee respectfully recommends that after 1920 the Oto-Laryngologic Sections require for admission the successful passing of an examination similar to that required by the Ophthalmologic Section, which also makes the candidate eligible for the American College of Surgeons as to professional qualifications.

Examinations to consist of written examinations on Anatomy, Histology, Embryology, Physiology and Pathology.

Oral Examinations, practical clinical methods of diagnosis, recognition of microscopic slides from pathologic specimens, therapeutics and relation to general diseases.

The candidate is to present at least twenty-five case reports.

Further details may be worked out by the examiners elected by the Society.

We further recommend that the Society elect a board of three (at least) Examiners.

(Signed) JOS. C. BECK,
JOHN M. INGERSOLL,
T. E. CARMODY.

On motion, duly supported, this resolution was adopted.

THE CHAIR: The Constitution is practically the one adopted years ago and it seems wise to make certain revisions. We will hear a report of the proposed revisions.

DR. CALHOUN: Art. III, which reads that candidates for admission shall be in good standing in local, or county, or national societies. This shall read, "Candidates for active fellowship shall be a member in good standing of the local, county or state society." And the application shall be accompanied by the annual dues of $5.00, should be changed to say the "annual dues of $10.00."

In Art. IV, between the words Treasurer and Councillors, shall be inserted "Editor of Transactions."

Where it reads "the annual meeting shall be decided by the Council," should read "the time of the annual meeting shall be placed in October at a time and place designated by the Council at the annual meeting. In extraordinary stress, the time of meeting may be changed by a three-fourths vote of Council."

Art. II. The reading of each paper shall not occupy more than 20 minutes. The discussion of no member shall exceed five minutes. This should read, the paper may take not more than 20 minutes, the opening discussion not more than 20 minutes, and in the general discussion no member may exceed five minutes.

The Article which reads, "The President shall preside at all meetings of the Academy and the Council, etc. In addition he shall fill up appointments of vacancies occurring on the personnel of any committee. A new paragraph is added: "The Editor of the Transactions shall receive all papers and reports read before the Academy, with the discussions of the same, and with the aid of the Secretary and sanction of the Council shall compile and publish the Transactions."

The old paragraph on publication committee is thrown out.

The new paragraph on dues shall be "The entrance fee paid by the newly elected Fellow shall cover his fees to January 1st."

It is necessary to present these at this meeting in order that they may be formally presented one year from now.

THE CHAIR: Will Dr. Greenwood and Dr. Carmody please escort the newly elected President to the Chair.

DR. FRANCIS: I wish I could express my deep appreciation of the honor you have conferred upon me, gentlemen. I think you have made a great mistake, but I hope I may serve the Academy in the same way my predecessors have done. I feel it is a great honor to occupy the place that has been occupied by men like Drs. Jackson, Greenwood and Ingersoll. These are the men and those like them, who have made this Academy what it is. I thank you very deeply.

The business section of the Academy thereupon adjourned.

HONOR ROLL OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY* IN THE RECENT WORLD WAR.

Allen Greenwood, M. D., Boston, Mass.

Adams, Maj. Charles F. (O-L), Trenton, N. J. Camp Greene.
Allen, Lt. George H. (O-L), Topeka, Kan. Camp Funston.
Allen, Capt. Jos. H. (O-L), Denver, Colo. U. S. Gen. Hosp. No. 21.
Arbuckle, Capt. Milliard F., East St. Louis, Ill. Washington; London and Epsom, Eng.; Flanders; Somme; Sidcup.
Ayers, Capt. Wylie M. (O-L), Cincinnati, O. Base Hospital No. 110, A. E. F.
Aynesworth, Capt. Horace T. (O-L), Waco, Tex. Camp Bowie.
Bane, Capt. William C. (O-L), Denver, Colo. Base Hospital No. 29, A. E. F.
Banister, Col. John M., Omaha, Neb. Reg. A. M. C.
Barber, Lt. Frank (Oph), Rochester, N. Y. Camp Holobird, Md.; Ft. McHenry.
Barkan, Capt. Hans (Oph), San Francisco, Cal. Base Hospital, Camp Kearney.
Bartholomew, Capt. Alfred C. (O-L), Van Wert, O. Howard White; Sulphur Springs; Waynesville, N. C.
Beattie, Capt. Robert (Oph), Detroit, Mich. Base Hospital No. 101, A. E. F.
Beatty, Lt. Hugh C. (O-L), Columbus, O. Camp Dodge.
Beaudoux, Capt. Henry A. (O-L), St. Paul, Minn. N. Y. Neuro. School.
Bigelow, Lt. F. Nolton (O-L), Providence, R. I. Cape May Gen. Hosp. No. 11.
Black, Lt. Col. Nelson M. (Oph), Milwaukee, Wis. Member of Sub-Com. on Oph.; chief of Oph. Sec. S. G. O.; consultant in Oph., A. E. F., attached to Hqrs. Med. and Surg. Consultants.
Blakesley, Maj. T. S. (O-L), Kansas City, Mo. Base Hosp. No. 115, A. E. F.
Blue, Lt. Julian B. (Oph), Memphis, Tenn. Camp Taylor.
Boeckman, Capt. Egil (O-L), St. Paul, Minn. Camp Grant; Camp Custer.
Boner, Capt. G. W. (O-L), Ft. McHenry, Md. Gen. Hosp. No. 2, Ft. McHenry.
Boot, Capt. George W. (O-L), Evanston, Ill. Camp Pike; Camp Hosp. No. 7, A. E. F.
Bordley, Lt. Col. James, Jr. (Oph), Baltimore, Md. Chairman Sub-Com. on Oph. S. G. O.; Reconstruction Gen. Hosp., Roland Park.
Brawley, F. E., Chicago, Ill.
Breaks, Capt. Luther C. (O-L), Terre Haute, Ind. U. S. A. Hosp., Ft. Des Moines.
Britten, Maj. George S. (O-L), Syracuse, N. Y. R. C. Base Hosp. No. 31, A. E. F.
Brodrick, Lt. Col. Frank W., Sterling, Ill. C. O. Evac. Hosp. No. 26.
Brown, Lt. Walter B. (O-L), Pittsburgh, Pa. Camp Greene; Evac. Hosp. No. 53.
Bruner, Maj. William E. (Oph), Cleveland, O. S. G. O.
Bryant, Maj. William S. (O-L), New York City. R. C. Mil. Hosp. No. 3, A. E. F.
Buck, Capt. Robert H., Chicago, Ill. Camp Hosp. No. 28; Nevers; A. E. F.
Burch, Maj. Frank E. (Oph), St. Paul, Minn. Camp Dodge Base Hosp.

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*Oph indicates Ophthalmologic service; O-L indicates Oto-Laryngologic service.

Burns, Capt. Stanley S. (O-L), St. Louis, Mo. Camp McArthur; C. O. Evac. Hosp. No. 46, A. E. F.

Byrnes, Capt. Harry F. (Oph), Springfield, Mass. R. C. Hosp. No. 32, A. E. F.

Calhoun, Maj. F. Phinizy (Oph), Atlanta, Ga. Camp Gordon Base Hosp.; Gen. Hosp. No. 6.

Campbell, Maj. C. H. (Oph), Columbus, Neb. T. C. Fort Riley; Base Hosp. No. 99, A. E. F.

Carmody, Maj. Thomas E. (O-L), Denver, Colo. Gen. Hosp. No. 21, Denver.

Carpenter, Capt. E. R., El Paso, Tex. Camp Kearney, Cal.

Carson, Lt. W. E., Pittsburgh, Pa. U. S. Naval Reserve Force.

Charlton, Lt. (jg) C. Coulter, Atlantic City, N. J. U. S. Naval Reserve Force.

Clark, Capt. Frederick T. (Oph), Westfield, Mass. Camp Devens; Fort Ethan Allen.

Coble, Capt. Paul B. (O-L), Indianapolis, Ind. Base Hosp. No. 80, A. E. F.

Collins, Capt. E. W. (O-L), Denver, Colo. Gen. Hosp. No. 21.

Collins, Maj. Joseph D. (O-L), Northampton, Mass. M. O. T. C. Fort Benj. Harrison; Camp Devens Base Hosp.; Base Hosp. No. 139, A. E. F.

Connor, Capt. Ray (Oph), Detroit, Mich. Base Hosp. No. 8, A. E. F.; Consultant, Savenay area.

Corser, Maj. John B. (Oph), Scranton, Pa. T. C. Fort Oglethorpe; Gen. Hosp. No. 1; Com. Off. Mobile Hosp. No. 5, A. E. F.

Cott, Capt. George F., Buffalo, N. Y. Buffalo Gen. Hosp.; Plattsburg for exam. of aviators.

Covington, Maj. Lewis C. (O-L), Charleston, W. Va. Base Hosp. Cody; Base Hosp. No. 141, A. E. F.

Craig, Alex. R., Chicago, Ill.

Crampton, Lt. Col. G. G., Philadelphia, Pa. Director of Field Hosps. in all operations of 28th Div., A. E. F.; in charge of Dept. Urology, Paris Dist.

Creighton, Lt. W. J. (Oph), Philadelphia, Pa. Camp Meade; Att. Surg. Office.

Creviling, Capt. H. C. (O-L), St. Louis, Mo. Base Hospital, Camp Travis.

Crockett, Capt. R. L. (Oph), Oneida, N. Y. Base Hosp., Camp Meade.

Cutler, Capt. Franklin E., Cleveland, O. Air Service Div., medical; last station, Com. Off. P. E. U., New York City.

Day, Maj. Ewing W. (O-L), Pittsburgh, Pa. Base Hosp., Camp Lee; Neuro. Surg. School; Special Assignment, Pittsburgh.

Dean, Commander F. W., Council Bluffs, Ia. U. S. Navy.

Dennis, Capt. Frank L., Colorado Springs, Colo. Camp Lewis; Mineola, L. I.; Washington; Rockwell Field; Supt. Surg. West. Dist. Air Service.

Derby, Lt. Col. G. S. (Oph), Boston, Mass. Base Hosp. No. 5, A. E. F.; Asst. Consultant Oph., A. E. F.

Dorento, Capt. D. R. (O-L), Fort Smith, Ark. Camp Beauregard.

Dowling, Lt. J. T., Seattle, Wash. U. S. Naval Force.

Duntley, Capt. George S. (Oph), Bushnell, Ill. Base Hosp., Camp Grant.

Earel, Capt. John W. (Oph), Quincy, Ill. T. C. Fort Benj. Harrison; Camp Sherman; Camp Jackson; Base Hosp. No. 60, A. E. F.

Edson, Capt. Ray A. (Oph), Buffalo, N. Y. T. C. Plattsburgh; Base Hosp. Camp Devens; Camp Crane; Base Hosp. No. 113, Port of Embarkation; Lehigh Univ., Bethlehem, Pa.; Base Hosp. No. 113, A. E. F.

Edwards, C. J., Vicksburg, Miss.

Edwards, Lt. W. A., La Crosse, Wis. Fort Sheridan, Ill.; Fort Brady, Mich.

Ellett, Lt. Col. E. C. (Oph), Memphis, Tenn. Assigned to aid at Memphis to conduct examinations; Pres. Exam. Board for aviators; Base Hosp., Camp Meade; Chief of Surg. Serv. Base Hosp., Camp Meade; S. G. O.; Gen. Hosp. No. 11, Cape May; Com. Off. Base Hosp. No. 115, A. E. F.; Consultant, Vichy area.

Fairbairn, Maj. J. F. (O-L), Buffalo, N. Y. Base Hosp. No. 23, A. E. F.; Base Hosp. No. 24, A. E. F.; Consultant, Nantes area.
Farmer, Maj. A. G., Dayton, O. Post Surgeon, Wilbur Wright Aviation Field, Dayton.
Farrell, Maj. P. J. H. (Oph), Chicago, Ill. Base Hosp. Camp Travis; Com. Off. Base Hosp., A. E. F.
Finnoff, Capt. William C. (Oph), Denver, Colo. T. C. Fort Riley; Camp Funston; 354th Infantry; Evac. Hosp. No. 29; Camp Cody; Base Hosp. No. 29, A. E. F.
Fisher, Capt. Carl (Oph), Rochester, Minn. Base Hosp. No. 115, A. E. F.
Floyd, Capt. Thomas W. (Oph.), Peoria, Ill. Base Hosp., Camp Custer.
Foley, Capt. J. W. (Oph), Denver, Colo. Base Hosp., Camp Cody.
Forbes, Capt. H. H. (O-L), New York City. Base Hosp. No. 116, A. E. F.
Foster, E. E., New Bedford, Mass., U. S. Naval R. F.
Foster, Lt. J. H., Houston, Tex. U. S. Naval Reserve Force.
Fowler, Capt. S. R. (O-L), Syracuse, N. Y. Camp Taylor.
Francis, Capt. L. M. (Oph), Buffalo, N. Y. Gen. Hosp. No. 11, Cape May; Base Hosp. No. 115, A. E. F.; in charge of Oph. Service.
Fringer, Capt. W. R., Rockford, Ill. T. C. Fort Oglethorpe; Base Hosp., Jacksonville, Fla.
Frost, Maj. W. S., Spokane, Wash. A. E. F.
Fryer, Maj. J. L. (Oph), Leavenworth, Kan. Post Hosp., Fort Leavenworth.
Fuller, Lt. T. E. (O-L), Texarkana, Ark. Camp Pike Replacements.
Gilbert, Capt. F. Y. (Oph), Portland, Me. Base Hosp. Camp Devens; Camp Hosp. No. 20, A. E. F.
Gill, Capt. George (O-L), Elyria, O. Camp Lee.
Gleason, Capt. E. B., Philadelphia, Pa. Not on active duty.
Goldstein, Maj. M. A. (O-L), St. Louis, Mo. Camp Dodge.
Goodell, Capt. William (O-L), Springfield, Mass. Attending Surgeon's Office.
Gradle, Maj. H. S. (Oph), Chicago, Ill. T. C. Fort Riley; Base Hosp., Camp Grant, Ill.; Camp Mills; Rantoul Aviation Field; Fort Sheridan; Asst. Div. Surg., 86th Div.; San. Insp. Base section No. 2, Bordeaux.
Graham, Lt. H. B., San Francisco, Cal. U. S. Naval Reserve Force.
Green, Capt. L. D. (Oph), San Francisco, Cal. Camp Kearney.
Greenwood, Lt. Col. Allen (Oph), Boston, Mass. Member Sub-Com. on Oph.; S. G. O., Washington; Senior Consultant, Oph., A. E. F.
Grushlow, Israel, New York City.
Guthrit, Capt. A. L., Oklahoma City, Okla. Fort Riley; Camp Wadsworth.
Guthrie, Capt. J. M. (Oph), Meridian, Miss. Base Hosp, Camp Shelby.
Haden, Maj. H. C. (Oph), Galveston, Tex. Gen. Hosp. Walter Reed, Washington.
Hampton, Maj. R. R., Salt Lake City, Utah. Salt Lake City; Av. Exam. Unit, Mineola, L. I.; Med. Res. Lab., Love Field, Dallas (Flight Surg.); Issoudan; Indre, France.
Harkness, Capt. G. F. (O-L), Davenport, Ia. Camp Jackson.
Haskell, Capt. A. D. (Oph), Portland, Ore. T. C. Fort Benj. Harrison; Camp Devens; Base Hosp. No. 76, A. E. F.
Haskin, Lt. Col. W. H. (O-L), New York City. Surg's Off. U. S. Mil. Acad.
Hauer, Lt. A. M., Columbus, Ohio. U. S. Naval Reserve Force.
Haughey, Capt. Wilfrid (Oph), Battle Creek, Mich. Base Hosp. No. 36, Detroit; Base Hosp. No. 36, A. E. F.
Hayden, A. A., Chicago, Ill.
Hays, Maj. H. N. (O-L), Rochester, N. Y. Base Hospital, Camp Jackson.
Heggie, Maj. N. M. (Oph), Jacksonville, Fla. T. C. Fort Oglethorpe.
Heitger, Joseph D., Louisville, Ky.
Henning, Capt. Carl, Washington D. C. Prof. of Oph. Army Med. School; in charge Phys. Exam. Unit, Air Service, Washington; Ophthal. to U. S. Soldiers' Home, Washington, D. C.

Henninger, Capt. L. I. (Oph), Council Bluffs, Ia. Base Hosp., Camp Dodge; Fort Porter; N. Y. Hosp. Unit "K"; Camp Hosp. No. 27, A. E. F.

Hickey, Lt. Col. Preston W., Detroit, Mich. Base Hospital No. 17, Dijon; Chief Surg's Off., Paris; Hqrs. of Consult. Neufchateau.

Hilger, Capt. A. W. (O-L), St. Paul, Minn. Camp Dodge.

Hitz, Maj. H. B. (O-L), Milwaukee, Wis. A. C. Base Hosp. No. 22, A. E. F.

Hogue, Maj. Gustavus I., Milwaukee, Wis. Camp McArthur, Tex.; Base Hosp., Camp McClellan, Ala.; Evac. Hosp. No. 1, A. E. F.; Consultant, Toul area.

Holloway, T. B., Philadelphia, Pa. U. S. Naval Reserve Force.

Holmes, Maj. C. R. (O-L), Cincinnati, O. Base Hospital, Camp Sherman.

Holt, Lt. E. E., Portland, Me. Med. Aide to Gov. of Maine in establishing and supervising Med. Advis. Boards; Bureau of War Risk Ins., Washington.

Hompes, Capt. J. J. (Oph), Lincoln, Neb. Base Hospital, Camp Funston.

Hopkins, Lt. W. E. (O-L), New York City. Base Hosp. No. 45, A. E. F.

Horn, Henry, San Francisco, Cal.

Hubby, Capt. L. M. (O-L), New York City. R. C. Base Hosp. No. 2, A. E. F.

Hussey, Capt. E. J. (Oph), Holyoke, Mass. Base Hosp., Camp Devens; Direc. Camp Crane; Pa. Base Hosp. No. 108, for overseas service.

Iglauer, Capt. Samuel (O-L), Cincinnati, O. Fort Sill.

Imperatori, Lt. Col. Charles J., New York City. Com. Off. 309th San. Train, 84th Div., in U. S. and A. E. F.

Ingersoll, Maj. John M. (O-L), Cleveland, O. Gen. Hosp. No. 11, in charge of Oto-Laryngology.

Irvine, Capt. Alexander R. (Oph), Salt Lake City, Utah. Base Hosp., Camp Fremont.

Israel, Lt. Sidney (O-L), Houston, Tex. Fort Oglethorpe.

Jacobs, Capt. Max W., St. Louis, Mo. Base Hosp., Camp Sheridan; Evac. Hosp. No. 34, Camp Sheridan and A. E. F.; Base Hosp. No. 69, A. E. F.; Hosp. Train Serv., A. E. F.

Jessamin, Capt. Leon W. (Oph; O-L), Framingham, Mass. Base Hosp. No. 2, A. E. F.

Johnson, Capt. Otis H. (O-L), New York City. Fort Benj. Harrison; Camp Devens; Base Hosp. No. 52, A. E. F.

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Boiler, W. F.....420 South Dodge St., Iowa City, Ia., OALR
Bone, H. D.....29 Parker St., Gardner, Mass., OALR
Boner, G. W.....K. of C. Bldg., Washington, Ind.
Bonner, H.....840 Fidelity Medical Bldg., Dayton, O., OALR
Boot, G. W.....25 E. Washington St., Chicago, Ill., OALR
Bordley, James, Jr.....330 N. Charles St., Baltimore, Md., Op.
Boucher, R. B.....414 Banks Bldg., Vancouver, B. C.
Bowles, F. J.....152 West 73rd St., New York City, N. Y., OALR
Boyce, G. H.....Iron Mountain, Mich., OALR
Boyce, Wm. B.....1019 Ludington St., Escanaba, Mich., OALR
Boyd, E. T.....206 Century Bldg., Denver, Colo., OALR
Boyd, G.....167 Bloor St., Toronto, Can., ALR
Bradfield, J. A. L.....State Bank Bldg., La Crosse, Wis., OALR
Brainerd, J. B.....419 Boylston St., Boston, Mass., ALR
Braulin, Wm. H.....Marion, Ind.
Brawley, F. E.....Michigan Blvd. Bldg., Chicago, Ill., OALR
Brawley, R. V.....Salisbury, N. C.
Bray, E. R.....934 Ashland Ave., St. Paul, Minn., OALR
Breaks, L. Z.....Terre Haute Trust Bldg., Terre Haute, Ind., Op.
Bribach, E. J.....212 Simpson Bldg., Atchison, Kas.
Briggs, W. E.....Box 166, Sacramento, Cal., OALR
Britten, G. S.....University Blk., Syracuse, N. Y., OALR
Brobst, C. H.....Central Bank Bldg., Peoria, Ill., OALR
Brodie, G. M.....Woodstock, Ont., OALR
Brodrick, F. W.....Sterling, Ill., OALR
Brooks, E. B.....1010 Terminal Bldg., Lincoln, Neb.
Brooks, E. H.....808 College Ave., Appleton, Wis., OALR
Brose, L. D.....501 Upper First Ave., Evansville, Ind., OALR
Brown, C. M.....510 Delaware Ave., Buffalo, N. Y., ALR
Brown, E. J.....Syndicate Bldg., Minneapolis, Minn., OALR
Brown, E. T.....30 Church St., Burlington, Vt., OALR
Brown, H. A.....Medical Bldg., San Francisco, Cal., OALR
Brown, H. H.....Columbus Memorial Bldg., Chicago, Ill., OALR
Brown, J. E.....239 East Town St., Columbus, O., OALR
Brown, J. M.....Brockman Bldg., Los Angeles, Cal., ALR
Brown, L. E.....411 Metropolitan Bldg., Akron, O., OALR
Brown, S. H.....1901 Mt. Vernon St., Philadelphia, Pa., Op.
Brown, W. H...Brit. N. A. Bank Bldg., Edmonton, Alberta, Can., OALR
Brown, W. E.....Union Arcade Bldg., Pittsburgh, Pa., OALR
Broyles, C. J.....Johnson City, Tenn.
Bruder, J.....230 West 79th St., New York City, N. Y., OALR
Bruére, G. E.....Journal Bldg., Portland, Ore., OALR
Bruner, W. E.....Guardian Bldg., Cleveland, O., Op.
Brust, H. O.....720 South Crouse Ave., Syracuse, N. Y., ALR
Bryan, W. M. C.....Humboldt Bldg., St. Louis, Mo., ALR
Bryant, A. G.....502 Beacon St., Boston, Mass.
Buck, R. H.....Venetian Bldg., Chicago, Ill., OALR
Buckman, E. V.....70 South Franklin St., Wilkes-Barre, Pa. OALR
Buckhanan, James N.....Mineola, N. Y.
Bukett, H. S.....252 Mountain St., Montreal, Can., ALR
Bull, E. L.....100 Sip Ave., Jersey City, N. J., OALR
Bulson, A. E., Jr.....406 West Berry St., Ft. Wayne, Ind., OALR
Burch, F. C.....Lowry Bldg., St. Paul, Minn., A
Burke, T. A.....446 Rose Bldg., Cleveland, O., OALR
Burleson, J. H.....Hicks Bldg., San Antonio, Tex., OALR
Burns, S. S.....Humboldt Bldg., St. Louis, Mo., ALR
Burroughs, G. M.....5 Broad St., Danielson, Conn., Op.
Burton, F. A.....Watts Bldg., San Diego, Cal., ALR

Butt, M. M.....1701 Chestnut St., Philadelphia, Pa., Op.
Byrnes, H. F.....4 Chestnut St., Springfield, Mass., OALR
Byrnes, M. R.....Crete, Neb., OALR

Cahill, J. W.....390 Main St., Worcester, Mass.,
Cain, C. M.....Hume-Mansur Bldg., Indianapolis, Ind., OALR
Caldwell, R.....State Nat. Bank Bldg., Little Rock, Ark., OALR
Calhoun, F. P.....Candler Bldg., Atlanta, Ga., OALR
Callan, P. A.....452 Fifth Ave., New York City, N. Y., Op.
Callfas, W. F.....567 Brandeis Bldg., Omaha, Neb.
Camp, W. E.....910 Donaldson Bldg., Minneapolis, Minn.
Campbell, C. H.....Columbus, Neb.
Campbell, D. A.....Peter Smith Bldg., Detroit, Mich., OALR
Campbell, D. M.....Peter Smith Bldg., Detroit, Mich., OALR
Campbell, Wm. King.....96 Third Ave., Long Branch, N. J.
Capron, F. P.....118 Angell St., Providence, R. I., OALR
Carleton, Ralph.....10 Temple St., Springfield, Mass., Op.
Carleton, E. H.....Hanover, N. H., ALR
Carmack, J. W.....37 Willoughby St., Indianapolis, Ind.
Carmody, T. E.....Metropolitan Bldg., Denver, Colo., ALR
Carpenter, E. R.....Stanton and Wyoming Sts., El Paso, Tex., OALR
Carpenter, M. W.....503 Osborn Bldg., Cleveland, O.
Carr, G. W.....30 South Franklin St., Wilkes-Barre, Pa., OALR
Carroll, G. G.....614 Main St., West., Rochester, N. Y., OALR
Carroll, F.....Ely Blk., Cedar Rapids, Ia., OALR
Carson, W. E.....Jenkins Arcade Bldg., Pittsburgh, Pa.
Carter, W. W.....69 West 50th St., New York City, N. Y., ALR
Carvill, Lizzie M.....101 Newbury St., Boston, Mass., Op.
Cary, E. H.....Southwestern Life Bldg., Dallas, Tex., OALR
Cary, G. C.....Grand Junction, Colo., OALR
Case, G. M.....154 Main St., Elmira, N. Y., OALR
Cavanaugh, J. A.....7 W. Madison St., Chicago, Ill., ALR
Cayce, E. B.....Hitchcock Bldg., Nashville, Tenn., OALR
Chambers, T. R.....15 Exchange Place, Jersey City, N. J., OALR
Chapman, V. A.....Wells Bldg., Milwaukee, Wis., OALR
Charlton, C. C.....124 South Illinois St., Atlantic City, N. J., ALR
Chattin, J. Franklin.....671 Broad St., Newark, N. J.
Chenery, W. E.....222 Huntington Ave., Boston, Mass., ALR
Cheney, F. E.....64 Commonwealth Ave., Boston, Mass., Op.
Childs, H. A.....Eagle Blk., Creston, Ia., OALR
Claiborne, John H., Jr.....8 West 40th St., New York City, N. Y., Op.
Clark, F. T.....92 Broad St., Westfield, Mass., OALR
Clark, H. S.....Syndicate Bldg., Minneapolis, Minn., OALR
Clark, J. S.....67 Stephenson St., Freeport, Ill., OALR
Clark, L. H.....337 Monroe Ave., Rochester, N. Y., OALR
Clay, G. E.....426 Candler Bldg., Atlanta, Ga.
Clement, C. C.....Venetian Bldg., Chicago, Ill., OALR
Clevenger, W. F.....Newton Claypool Bldg., Indianapolis, Ind., ALR
Cobb, C. M.....10 Nahant St., Lynn, Mass., OALR
Cobb, Edwin .....Masonic Temple, Marshalltown, Ia., OALR
Coble, P. B.....Pennway Bldg., Indianapolis, Ind., ALR
Cochran, R. W.....Madison, Ind., OALR
Cogan, J. E.....Rose Bldg., Cleveland, O., OALR
Coghlan, J. N.....Selling Bldg., Portland, Me.
Cohen, Martin .....1 West 85th St., New York City, N. Y., OALR
Cohn, F. .....31 East 60th St., New York City, N. Y., ALR
Cohn, S. .....Fulton, Ky., OALR
Collins, E. W.....Metropolitan Bldg., Denver, Colo., ALR
Collins, H.....New Jersey Bldg., Duluth, Minn., OALR
Collins, J. D.....90 Main St., Northampton, Mass., ALR
Colver, B. N.....182 Manchester St., Battle Creek, Mich., OALR
Conboy, P. .....82 East Ave., Rochester, N. Y., OALR

Conkey, C. D.....600 Fidelity Bldg., Duluth, Minn.
Conlon, F. A.....Bay State Bldg., Lawrence, Mass.
Conner, Ray.....503 Washington Arcade, Detroit, Mich., OALR
Cook, S. E.....Richards Blk., Lincoln, Neb., OALR
Cooper, C. E.....Metropolitan Bldg., Denver, Colo., ALR
Cooper, H. W.....Steubenville, O.
Coover, D. H.....Metropolitan Bldg., Denver, Colo., Op.
Corser, J. B.....Scranton Private Hospital, Scranton, Pa., OALR
Cott, C. C.....1001 Main St., Buffalo, N. Y., ALR
Cott, G. F.....1001 Main St., Buffalo, N. Y., ALR
Coulter, C. F.....First National Bank Bldg., Great Falls, Minn.
Covington, L. C.....217½ Capitol Ave., Charleston, W. Va.
Cowper, H. W.....543 Franklin St., Buffalo, N. Y., Op.
Craig, A. R.....535 North Dearborn St., Chicago, Ill.
Craighead, Nancy B.....7002 Jenkins Arcade Bldg., Pittsburgh, Pa.
Crampton, G. S.....1700 Walnut St., Philadelphia, Pa., Op.
Crawford, J. H.....Grant Bldg., Atlanta, Ga., OALR
Creighton, W. J.....1905 Chestnut St., Philadelphia, Pa., Op.
Crisp, W. H.....Metropolitan Bldg., Denver, Colo., Op.
Crockett, R. L.....Oneida, N. Y., Op.
Croskey, J. W.....1909 Chestnut St., Philadelphia, Pa., OALR
Cross, A. E.....Slater Bldg., Worcester, Mass., Op.
Cross., G. H.....525 Welsh St., Chester, Pa.
Crossfield, Fred .....75 Pratt St., Hartford, Conn., ALR
Crossley, E. R.....29 E. Madison St., Chicago, Ill.
Crump, J. F.....507 Citizens Bank Bldg., Pine Bluff, Ark., OALR
Culbertson, L. R.....Masonic Temple, Zanesville, O., OALR
Cullom, M. M.....Hitchcock Bldg., Nashville, Tenn., OALR
Curdy, R. J.....1134 Rialto Bldg., Kansas City, Mo., Op.
Curry, G. E.....Westinghouse Bldg., Pittsburgh, Pa., Op.
Curtis, W. L.....Fairbury, Neb., OALR
Cutler, F. E.....Rose Bldg., Cleveland, O., ALR

Dabney, V.....1633 Connecticut St., Washington, D. C., ALR
Dabney, S. G.....216 West Chestnut St., Louisville, Ky., OALR
Dabney, W. R.....Cuyahoga Falls, O., OALR
Dancy, A. B.....First National Bank Bldg., Jackson, Tenn., OALR
Daniels, R. L.....New Bern, N. C.
Davis, A. E.....47 East 57th St., New York City, N. Y., Op.
Davis, C. H.....513 Walnut St., Knoxville, Tenn., OALR
Davis, G. E.....42 West 77th St., New York City, N. Y., OALR
Davis, J. E.....Kress Bldg., McAlister, Okla., OALR
Davis, J. L.....135 South 18th St., Philadelphia, Pa., ALR
Davis, T. A.....578 Sherbourne St., Toronto, Can., OALR
Davis, W. Thornwall.....927 Farragut Sq., Washington, D. C.
Day, E. W.....Westinghouse Bldg., Pittsburgh, Pa., ALR
Dayton, G. O.....Lewisohn Bldg., Butte, Mont., OALR
Dayton, W. L.....302 Funke Bldg., Lincoln, Neb., OALR
Dean, F. W.....National Bank Bldg., Council Bluffs, Ia., OALR
Dean, Walter.....Stark Bldg., Louisville, Ky.
Dean, L. W.....12 South Clinton St., Iowa City, Ia., OALR
Decherd, H. B.....Wilson Bldg., Dallas, Tex., OALR
Decker, J. C.....First National Bank Bldg., Cheyenne, Wyo., OALR
Dennis, D. N.....221 West Ninth St., Erie, Pa., Op.A
Dennis, F. L.....Burns Bldg., Colorado Springs, Colo., ALR
Dennis, G. J.....25 East Washington St., Chicago, Ill., ALR
Derby, G. S.....7 Hereford St., Boston, Mass.
Detling, F.....Investment Bldg., Los Angeles, Col., OALR
Dewey, C. H.....Perry, Ia.
Dickinson, B. M.....637 Union Arcade, Pittsburgh, Pa., ALR
Dillon, J. A.....310 Main St., Springfield, Mass., ALR
Dimitry, T. J.....Maison Blanche Bldg., New Orleans, La., Op.
Dixon, G. S.....40 East 41st St., New York City, N. Y., R

Dixon, W. E.....National Bank Bldg., Oklahoma City, Okla., OALR
Doane, L. L.....Odd Fellows Temple, Butler, Pa., OALR
Dodd, O.....30 North Michigan Blvd., Chicago, Ill., Op.A
Donoher, W. D.....Boston Bldg., Salt Lake City, Utah, OALR
Donovan, J. A.....Phoenix Bldg., Butte, Mont., OALR
Dolman, Perc. .....Butler Bldg., San Francisco, Cal.
Dorento, D. R.....Merchants Nat. Bank Bldg., Fort Smith, Ark., OALR
Dorsey, J. G.....201 North Main St., Wichita, Kan., OALR
Dow, F. E.....Central Chambers, Northampton, Mass., Op.
Dowling, J. I.....116 Washington Ave., Albany, N. Y., OALR
Dowling, J. T.....Cobb Bldg., Seattle, Wash., OALR
Dresel, G.....209 Post St., San Francisco, Cal.
Duane, A. .....139 East 37th St., New York City, N. Y., Op.
Duane, J. F.....Jefferson Bldg., Peoria, Ill., OALR
Dudley, W. H.....Brockman Bldg., Los Angeles, Cal., OALR
Dulaney, O.....Dyersburg, Tenn.
Duncan, A.....25 East Washington St., Chicago, Ill., OALR
Dunn, I. J.....Masonic Temple, Erie, Pa., OALR
Dunn, O. B.....4th and Railroad Sts., Ironton, O.
Duntley, G. S.....Bushnell, Ill., OALR
Dutrow, H. V.....Reibold Bldg., Dayton, O., OALR
Dwight, C. G.....Pioneer Bldg., Madison, Wis., OALR

Earel, A. M.....Hooperston, Ill., OALR
Earel, J. W.....Sterns Bldg., Quincy, Ill., OALR
Easton, J. C.....Fairbanks Bldg., Springfield, O., OALR
Edgar, T. O.....Dixon, Ill., OALR
Edson, R. .....560 Delaware Ave., Buffalo, N. Y., Op.
Edwards, C. J.....1422 Wash St., Vicksburg, Miss., OALR
Edwards, S. R.....701 Physicians Bldg., San Francisco, Cal.,
Edwards, W. A.....329 Main St., La Crosse, Wis., OALR
Eigler, C. O.....1300 Gaylord St., Denver, Colo., OALR
Ellegood, J. A.....Equitable Bldg., Wilmington, Del., OALR
Ellett, E. C.....Exchange Bldg., Memphis, Tenn., Op.
Ellis, J. C.....Kress Bldg., Houston, Tex., OALR
Emerson, L. .....Metropolitan Bldg., Orange, N. J., OALR
Engle, H. P.....200 Olive St., Newton, Ia., OALR
Estabrook, C. T.....390 Main St., Worcester, Mass., OALR
Esterly, D. E.....Mills Bldg., Topeka, Kan., OALR
Evensen, H. O.....25 East Washington St., Chicago, Ill.
Ewing, U. B. G.....Knollenberg Annex Bldg., Richmond, Ind., OALR

Fagin, Robert.....930 Exchange Bldg., Memphis, Tenn., Op.
Faith, Thomas.....31 North State St., Chicago, Ill., OALR
Fallows, H. D.....New Hampton, Ia., OALR
Farmer, A. C.....1040 Fidelity Med. Bldg., Dayton, O., OALR
Farnesworth, M. A.....146 Greenwood St., Battle Creek, Mich.
Farnsler, H. H.....1438 Market St., Harrisburg, Pa.
Farrington, P. M.....40 South Idlewild St., Memphis, Tenn., ALR
Fawcett, I. .....Schmulbach Bldg., Wheeling, W. Va., OALR
Feinfold, M.....4206 St. Charles Ave., New Orleans, La., Op.
Fellows, G. G.....30 North Michigan Blvd., Chicago, Ill., OALR
Felt, Carl L. .....2007 Chestnut St., Philadelphia, Pa., ALR
Fernandez, Francisco M.....Prado 105, Havana, Cuba, OALR
Ferguson, E. I..State National Bank Bldg., Oklahoma City, Okla., OALR
Finnoff, W. C.....Metropolitan Bldg., Denver, Colo., Op.A
Fischer, V. B.....Mercantile Bank Bldg., Boulder, Colo., OALR
Fisher, C. .....Rochester, Minn., Op.A
Fisher, Wm. A.....31 North State St., Chicago, Ill., OALR
Fiske, G. F.....25 East Washington St., Chicago, Ill.
Fitzpatrick, T. V.....19 West 7th St., Cincinnati, O., ALR
Flagg, J. D.....473 Virginia St., Buffalo, N. Y., Op.A
Flatley, T. J.....Reliance Bldg., Moline, Ill., OALR

Fleming, E. W.....Savings & Trust Bldg., Los Angeles, Cal., ALR
Floyd, T. W.....Lehman Bldg., Peoria, Ill.
Foley, J. W.....Majestic Bldg., Denver, Colo., OALR
Forbes, H. H.....40 East 41st St., New York City, N. Y., ALR
Forsythe, E. A.....471 Virginia St., Buffalo, N. Y., ALR
Forsythe, S. T.....1011 Euclid Ave., Cleveland, O.
Fort, A. G.....833 Candler Bldg., Atlanta, Ga.
Foster, Hal.....Altman Bldg., Kansas City, Mo., ALR
Foster, J. H.....Kress Med. Bldg., Houston, Tex., ALR
Foster, J. M.....Metropolitan Bldg., Denver, Colo., OALR
Fowler, S. R.....University Bldg., Syracuse, N. Y., ALR
Fox, L. W.....1636 Spruce St., Philadelphia, Pa., Op.
Fox, R. D.....411 Unity Bldg., Bloomington, Ill., OALR
Francis, C. H.....30 North Michigan Blvd., Chicago, Ill., ALR
Francis, Lee M.....636 Delaware Ave., Buffalo, N. Y. Op.
Frank, A. C.....308 Diamond Bank Bldg., Pittsburgh, Pa.
Frank, Ira .....104 South Michigan Blvd., Chicago, Ill., ALR
Freedman, L. M.....419 Boylston St., Boston, Mass., ALR
Freligh, C. A.....Palmer, Mass.
French, R. F.....Masonic Temple Bldg., Marshalltown, Ia., OALR
Freudenthal, W.....59 East 75th St., New York City, N. Y., ALR
Frey, C. L.....529 Vine St., Scranton, Pa., OALR
Fridenberg, P. H.....38 West 59th St., New York City, N. Y., OALR
Friedman, D.....44 West 77th St., New York City, N. Y., ALR
Friedenwald, H.....1029 Madison Ave., Baltimore, Md., Op.A
Fringer, W. R.....Wm. Brown Bldg., Rockford, Ill., Op.
Frost, W. S.....Paulsen Bldg., Spokane, Wash., OALR
Fullenwider, C. M.....Barnes Bldg., Muskogee, Okla., OALR
Fuller, T. E.....State National Bank Bldg., Texarkana, Tex.
Fulkerson, C. B...Kalamazoo Nat. Bank Bldg., Kalamazoo, Mich., OALR
Furgason, A. P.....Richards Blk., Lincoln, Neb., OALR

Gale, M. Jean.....517 Jacobson Bldg., Denver, Colo., Op.
Gallaher, T. J.....California Bldg., Denver, Colo., ALR
Garber, J. M.....48 Park Ave., Mansfield, O., OALR
Garraghan, E. F.....25 East Washington St., Chicago, Ill., OALR
Garrett, J. R.....Strickland Bldg., Roanoke, Va., OALR
Gatewood, W. L.....15 East 48th St., New York City, N. Y., ALR
Gavin, E. F.....Waukegan, Ill., OALR
Geiger, C. W.....Cobb Bldg., Kankakee, Ill., OALR
George, H. W.....254 Spruce St., Middleton, Pa., Op.
Gibson, Chas. M.....Globe Bldg., Pittsburg, Kan.
Gibson, R. D.....Dollar Savings & Trust, Youngstown, O., OALR
Gifford, H. .....Brandeis Bldg., Omaha, Neb., Op.A
Gilbert, F. Y.....148 Park St., Portland, Me., OAL
Gill, E. G.....McBain Bldg., Roanoke, Va.
Gill, G.....146 Middle Ave., Elyria, O., OALR
Gill, M. H.....Connecticut Mutual Bldg., Hartford, Conn., Op.A
Gillman, R. W.....33 Peterbow St., Detroit, Mich., Op.
Gittins, T. R.....Sioux City, Ia.
Givens, L. S.....Harrison Dep. Bank Bldg., Cynthiana, Ky., OALR
Gleason, E. B.....2033 Chestnut St., Philadelphia, Pa., OALR
Glogau, O. .....1320 Madison Ave., New York City, N. Y., OALR
Glosser, H. H.....448 Franklin St., Buffalo, N. Y., OALR
Glover, S. P.....1118 Twelfth Ave., Altoona, Pa., OALR
Goddard, H. M.....1338 Spruce St., Philadelphia, Pa., ALR
Goldbach, L. J.....322 North Charles St., Baltimore, Md., OALR
Goldsmith, P. G.....84 Carlton St., Toronto, Can.
Goldstein, M. A.....3858 Westminster Pl., St. Louis, Mo., ALR
Gorrell, T. J.....Vincennes Ave. & 16th St., Chicago Heights, Ill., OALR
Gordan, J. S.....309 Goldsmith Bldg., Milwaukee, Wis.
Gottlieb, M. J.....814 West End Ave., New York City, N. Y.
Gourley, G. F.....407 Sinclair Bldg., Steubenville, O.

Goux, L. J.....David Whitney Bldg., Detroit, Mich., OALR
Gradle, H. S.....22 E. Washington St., Chicago, Ill., Op.
Graham, H. B.....240 Stockton St., San Francisco, Cal., ALR
Graham, R. W.....Consolidated Bldg., Los Angeles, Cal., Op.
Grant, F. E.....Kal. Natl. Bank Bldg., Kalamazoo, Mich., OALR
Graves, W. H.....Commerce Bldg., Pittsburg, Pa., OALR
Green, A. S.....210 Post St., San Francisco, Cal., Op.
Green, J., Jr.....Metropolitan Bldg., St. Louis, Mo., Op.
Green, L. D.....210 Post St., San Francisco, Cal., Op.
Greenwood, A.....101 Newbury St., Boston, Mass., Op.
Grim, U. J.....30 N. Michigan Blvd., Chicago, Ill., OALR
Grosvenor, L. N.....378 Dakota St., Huron, S. D., OALR
Grove, W. E.....502 Wells Bldg., Milwaukee, Wis., OALR
Grushlaw, I.....271 Central Park W., New York City, N. Y., ALR
Guggenheim, L. K.....Carleton Bldg., St. Louis, Mo., ALR
Gundelach, C. A.....4500 Olive St., St. Louis, Mo., ALR
Guthrie, A. L.....Indian Bldg., Oklahoma City, Okla., OALR
Guthrie, J. M.....Rosenbaum Bldg., Meridian, Miss., OALR
Guttman, J.....60 St. Marks Pl., New York City, N. Y., OALR
Guyton, B. S.....University, Miss.
Gwinn, G. E.....Hicks Bldg., San Antonio, Tex., OALR

Hackney, F. J.....Hamilton Bank Bldg., Chattanooga, Tenn., OALR
Haden, H. C.....913 Union Natl. Bank Bldg., Houston, Tex.
Hadley, J. W.....Frankfort, Ind., OALR
Hager, W. A.....103 N. Lafayette St., South Bend., Ind., OALR
Hagler, A. L.....410 Capital Ave., Springfield, Ill., OALR
Hagler, E. E.....410 Capital Ave., Springfield, Ill., OALR
Haley, P. A.....Morrison Bldg., Charleston, W. Va., OALR
Hall, G. C.....Gaulbert Bldg., Louisville, Ky., OALR
Halstead, F. S.....708 Metropolitan Bldg., Denver, Colo.
Hampton, R. R.....Boston Bldg., Salt Lake City, Utah, OALR
Hancock, J. C.....135 Cambridge Pl., Brooklyn, N. Y., Op.
Hans, C. L.....2900 Grasselli Ave., New York City, N. Y.
Harbert, J. P.....Belfontaine, O.
Hardy, W. F.....Metropolitan Bldg., St. Louis, Mo., Op.
Harkness, G. F.....Whitaker Bldg., Davenport, Ia., OALR
Harris, C. M.....Johnstown Trust Co., Johnstown, Pa., OALR
Harris, H. B.....Fidelity Med. Bldg., Dayton, O., OALR
Harris, W. C.....Groton Bldg., Cincinnati, O., ALR
Harrison, W. G.....Empire Bldg., Birmingham, Ala., OALR
Hartley, F. A.....Fairbanks Bldg., Springfield, O., OALR
Hartz, H. J.....27 East Adams St., Detroit, Mich., ALR
Hartzel, Sol. M.....Dollar Bank Bldg., Youngstown, O., OALR
Harvey, N. D.....114 Waterman St., Providence, R. I., OALR
Haskell, A. D.....145 High St., Portland, Me., Op.
Haskin, W. H.....40 East 41st St., New York City, N. Y., ALR
Hatch, C. B.....3 West Church St., Newark, O., OALR
Hauer, A. M.....246 East State St., Columbus, O., OALR
Haughey, W.....24 West Main St., Battle Creek, Mich., OALR
Hawley, A. W.....Leary Bldg., Seattle, Wash., OALR
Hawley, C. W.....7 West Madison Ave., Chicago, Ill., OALR
Hays, H. N.....11 West 81st St., New York City, N. Y., ALR
Hays, S. B.....Atherton Bldg., Louisville, Ky., OALR
Hazlett, L. R.....117 South Main St., Butler, Pa., OALR
Heard, C. F.....Masonic Temple Bldg., Erie, Pa., OALR
Heard, Mary K.....24 N. Clinton St., Iowa City, Ia., Op.
Heath, A. C.....Lowry Bldg., St. Paul, Minn., ALR
Heckel, E. B.....Jenkins Arcade Bldg., Pittsburg, Pa., Op.
Heeb, H. J.....Loan & Trust Bldg., Milwaukee, Wis., OALR
Heed, C. R.....1402 Spruce St., Philadelphia, Pa., Op.
Heflebower, R. C.....The Lancaster, Cincinnati, O., OALR
Heggie, N. M.....Buckman Bldg., Jacksonville, Fla., OALR

Heitger, J. D.....Atherton Bldg., Louisville, Ky., OALR
Henderson, F. L.....Humboldt Bldg., St. Louis, Mo., Op.
Henning, Carl.....The Rochambeau, Washington, D. C., Op.
Henninger, L. L.....City Natl. Bank Bldg., Council Bluffs, Ia., OALR
Henton, Geo. E.....Morgan Bldg., Portland, Me.
Herriman, L. L.....Alamosa, Colo., OALR
Hess, W. L.....California Bldg., Denver, Colo., OALR
Hetzel, C. C.....Eccles Bldg., Ogden, Utah, OALR
Hickey, P. N.....32 West Adams St., Detroit, Mich., R
Higbee, E. H.....Grand and Olive Sts., St. Louis, Mo., Op.
Higginbotham, T. L....First Natl. Bank Bldg., Hutchinson, Kan., OALR
Higgins, S. G.....Wells Bldg., Milwaukee, Wis., OALR
Hill, A. J.....3351 S. Cleveland Ave., Canton, O., OALR
Hill, Clarence E.....160 Bloor St., W., Toronto, Can.
Hill, E.....30 North Michigan Blvd., Chicago, Ill., Op.
Hinnen, G. A.....1343 Delta Ave., Cincinnati, O., OALR
Hitz, H. B.....Goldsmith Bldg., Milwaukee, Wis., ALR
Hobart, Bertha K.....304 Produce Exch. Bldg., Toledo, O.
Hodson, B. F.....Miami, Fla., OALR
Hollis, W. A.....Hartford City, Ind.
Hoffman, J. R.....235 West Washington St., Chicago, Ill., OALR
Hogshead, J. M.....602 Georgia Ave., Chattanooga, Tenn., OALR
Hogue, D. W.....Fairbanks Bldg., Springfield, O., OALR
Hogue, G. I.....410 Jefferson St., Milwaukee, Wis., OALR
Hohf, J. A.....Clinic Bldg., Yankton, S. D., OALR
Holloway, T. B.....1819 Chestnut St., Philadelphia, Pa., Op.
Holmes, G. R.*.....10 East Eighth St., Cincinnati, O., OALR
Holt, E. E.....723 Congress St., Portland, Me., Op.A
Holt, E. E., Jr.....723 Congress St., Portland, Me., Op.A
Hompes, J. J.....Security Mutl Bldg., Lincoln, Neb., OALR
Hood, T. C.....Newton Claypool Bldg., Indianapolis, Ind., Op.
Hopkins, W. E.....515 Park Ave., New York City, N. Y., OALR
Horn, Henry.....135 Stockton St., San Francisco, Cal., ALR
Hovde, A. G.....Board of Trades Bldg., Superior, Wis., OALR
Howard, C. N.....Warsaw Clinic, Warsaw, Ind.
Howard, E. F.....1st Natl. Bank Bldg., Vicksburg, Miss.
Howard, J. W.....Rialto Bldg., Kansas City, Mo., OALR
Howe, L.....520 Delaware Ave., Buffalo, N. Y., Op.
Hubbard, A. E.....372 Franklin St., Buffalo, N. Y., Op.
Hubby, L. M.....27 West 68th St., New York City, N. Y., ALR
Hughes, W. F.....Hume-Mansur Bldg., Indianapolis, Ind., Op.
Huizinga, J. G.....Widdicomb Bldg., Grand Rapids, Mich., OALR
Hunter, J. E.....Greenville, O., OALR
Hurd, L. M.....39 East 50th St., New York City, N. Y., ALR
Hürf, J. W.....71 Washington St., Newark, N. J.
Hurley, E. D.....419 Boylston St., Boston, Mass., Op.
Hurley, E. H.....419 Boylston St., Boston, Mass., Op.
Hussey, E. J.....276 High St., Holyoke, Mass., OpLR

Iglauer, S.....Livingston Bldg., Cincinnati, O., ALR
Imperatori, C. J.....245 West 102nd St., New York City, N. Y., ALR
Ingerman, S. M.....Hotel Brunswick, New York City, N. Y., OALR
Ingersoll, J. M.....Osborn Bldg., Cleveland, O., ALR
Inglis, H. J.....43 Bay State Bldg., Boston, Mass., ALR
Ingram, L. C. M.....Dreka Bldg., DeLand, Fla., OALR
Irvine, A. R.....Kearns Bldg., Salt Lake City, Utah.
Irwin, F. N.....527 Fifth Ave., New York City, N. Y., OALR
Irwin, V. J.....351 Main St., Springfield, Mass., OALR
Isaacs, D.....Brandeis Theater Bldg., Omaha, Neb., OALR
Israel, Jos. P.....Naval Hospital, Ft. Lyon, Colo.
Israel, N. E.....404 Carter Bldg., Houston, Tex.
Israel, S. .....Carter Bldg., Houston, Tex., OALR

*Died.

Ivins, H. M. ..... 408 Second Ave., Cedar Rapids, Ia., OALR

Jackle, Arthur F. ..... 546 Delaware Ave., Buffalo, N. Y.
Jackson, C. ..... 17th and Walnut Sts., Philadelphia, Pa.
Jackson, E. ..... Majestic Bldg., Denver, Colo., Op.
Jackson, F. A. ..... 217½ First St., Salida, Colo.
Jackson, J. D. ..... 2324 West 8th St., Erie, Pa.
Jacobi, F. ..... Colton Bldg., Toledo, O., OALR
Jacobs, M. W. ..... Carleton Bldg., St. Louis, Mo., Op.
Jacobs, S. M. ..... 375 East 149th St., New York City, N. Y., OALR
Jacoby, D. P. A. ..... 106 Touro St., Newport, R. I., OpAL
Jamison, T. H. ..... Wellington, Kan., OALR
James, J. H. ..... Natl. City Bank Bldg., Mankato, Minn., OALR
Jarecky, H. ..... 138 West 86th St., New York City, N. Y., OALR
Jennings, J. E. ..... Carleton Bldg., St. Louis, Mo., OALR
Jessaman, L. W. ..... 30 Hollis St., Framingham, Mass., OALR
Jobson, G. B. ..... Franklin, Pa., OALR
Johnson, A. E. ..... Watertown, S. D., OALR
Johnson, J. H. ..... 106 W. 8th St., Coffeyville, Kan., OALR
Johnson, H. R. ..... 512 Walnut Ave., Fairmont, W. Va., OALR
Johnston, R. H. ..... 807 North Charles St., Baltimore, Md.
Johntson, W. H. ..... Layrel, Bldg., Muscatine, Ia., OALR
Johnston, Wilson ..... Stevens Bldg., Portland, Ore., OALR
Jones, E. L. ..... First Natl. Bank Bldg., Cumberland, Md., OALR
Jones, E. W. ..... 44 Atlanta St., Lynn, Mass., OpA
Jones, F. W. ..... Times Bldg., Alton, Ill.
Joyes, Crittendon .....
..... Farmers and Mechanics Natl. Bk. Bldg., Ft. Worth, Tex., OALR
Julien, W. F. ..... 690 Broadway, Gary, Ind., OALR
Judd, Harold B. ..... 47 East 57th St., New York City, N. Y.

Kaufman, A. S. ..... 254 South 16th St., Philadelphia, Pa., ALR
Keeler, J. C. ..... 254 South 16th St., Philadelphia, Pa., ALR
Keiper, G. F. ..... 14 North 6th St., Lafayette, Ind., OALR
Keith, D. M. ..... Rockford, Ill., ALR
Keith, W. E. ..... 807 Waldheim Bldg., Kansas City, Mo.
Kearby, D. O. ..... 422 Amer. Cen. Life Bldg., Indianapolis, Ind.
Keller, T. F. ..... The Spitzer, Toledo, Ohio, OALR
Keller, W. S. ..... Groton Bldg., Cincinnati, O., OALR
Kelly, C. W., Jr. ..... Atherton Bldg., Louisville, Ky., OALR
Kendall, M. R. ..... 614 Osborn Bldg., Cleveland, O.
Kerrison, P. D. ..... 70 East 42nd St., New York City, N. Y., ALR
Key, B. W. ..... 7 West 49th St., New York City, N. Y., Op.
Kiefer, H. A. ..... 406 Brockman Bldg., Los Angeles, Cal., OALR
Kimball, A. H. ..... The Farragut, Washington, D. C., Op.AL
Kimberlin, J. W. ..... Rialto Bldg., Kansas City, Mo.
Kincaid, J. H. ..... Ross Flats, Knoxville, Tenn., OALR
King, C. ..... Union Central Bldg., Cincinnati, O., Op.
King, G. L. ..... 537 East Market St., Alliance, O., OAR
King, J. J. ..... 40 East 41st St., New York City, N. Y., ALR
King, O. H. ..... Dugan Stuart Bldg., Hot Springs, Ark., OALR
Kirkendall, J. S. ..... 315 N. Aurora, Ithaca, N. Y., OALR
Kirkpatrick, S. ..... Lauerdale Ave., Selma, Ala., OALR
Kiser, J. D. ..... Bartlesville, Okla.
Kistler, O. F. ..... 43 North Franklin St., Wilkes-Barre, Pa., Op.AR
Kistner, F. B. ..... Stevens Bldg., Portland, Ore., ALR
Kittleson, T. N. ..... Fergus Falls, Minn., OALR
Kleene, F. ..... 1445 Wicker Park Ave., Chicago, Ill., OALR
Kline, H. G. ..... University Blk., Syracuse, N. Y., ALR
Klinedienst, J. F. ..... 220 South George St., York, Pa., OALR
Knapp, A. ..... 10 East 54th St., New York City, N. Y., Op.
Knapp, A. J. ..... Intermediate Life Bldg., Evansville, Ind., OALR
Knapp, B. ..... Evansville, Ind., OALR
Knapp, H. C. ..... Huntingburg, Ind., OALR

Kneedler, G. I. ..... Jenkins Arcade Bldg., Pittsburgh, Pa., ALR
Knovde, A. R. ..... Omaha Natl. Bank Bldg., Omaha, Neb., ALR
Knowles, W. F. ..... 220 Clarendon St., Boston, Mass., ALR
Kollock, C. W. ..... 86 Wentworth, Charleston, S. C., OALR
Kopetzky, S. J. ..... 616 Madison Ave., New York City, N. Y., ALR
Kraft, O. H. ..... 108 North State St., Chicago, Ill., Op.
Krauss, F. ..... 1701 Chestnut St., Philadelphia, Pa., OALR
Krug, E. F. ..... 12 West 44th St., New York City, N. Y., OALR
Krebs, A. ..... Jenkins Arcade Bldg., Pittsburgh, Pa., Op.
Krentzer, A. G. ..... Trust Natl. Bank Bldg., Milwaukee, Wis., ALR
Kress, G. H. ..... 245 Bradbury Bldg., Los Angeles, Cal., OALR
Krieger, G. M. ..... 4800 Whitsee Ave., Sta. M., Cincinnati, O., OALR
Krieger, Wm. A. ..... 35 Market St., Poughkeepsie, N. Y.
Kunz, Hugo ..... 640 Riverside Dr., New York City, N. Y., ALR
Kyle, J. J. ..... Title Ins. Bldg., Los Angeles, Cal., OALR

LaForce, B. D. ..... Hofman Bldg., Ottumwa, Ia., OALR
LaForce, E. F. ..... Tama Bldg., Burlington, Ia., OALR
Lamb, F. W. ..... 24 East 8th St., Cincinnati, O., OALR
Lamb, R. S. ..... Stoneleigh Ct., Washington, D. C., Op.
Lancaster, W. B. ..... 522 Commonwealth St., Boston, Mass., Op.
Lance, A. J.* ..... 15 Congress St., Portsmouth, N. H., OALR
Landfield, C. J. ..... Perrin Bldg., New Orleans, La., ALR
Landman, L. H. ..... 14 East 7th St., Cincinnati, O., OALR
Langworthy, H. G. ..... 10th and Bluff Sts., Dubuque, Ia., OALR
Lansing, J. H. ..... 626 Lathrop Bldg., Kansas City, Mo., ALR
Lapsley, P. M. ..... 100 N. Fifth St., Keokuk, Ia., OALR
Large, S. H. ..... 536 Rose Bldg., Cleveland, O., ALR
Larkin, B. J. ..... Hume-Mansur Bldg., Indianapolis, Ind., Op.
Larsen, C. L. ..... Lowry Bldg., St. Paul, Minn., OALR
Lassen, F. ..... First Natl. Bank Bldg., Pueblo, Colo., ALR
Lauder, S. E. ..... Osborn Bldg., Cleveland, O., Op.
La Vigine, A. A. ..... 129 West 46th St., New York City, N. Y., OALR
Lawrence, G. A. ..... Medical Arts Bldg., Philadelphia, Pa., Op.
Layman, D. W. ..... Hume-Mansur Bldg., Indianapolis, Ind., ALR
Leavy, C. A. ..... Metropolitan Bldg., St. Louis, Mo., ALR
Ledbetter, S. L. ..... First Natl. Bank Bldg., Birmingham, Ala., OALR
Lederman, I. A. ..... Atherton Bldg., Louisville, Ky., OALR
Leech, J. W. ..... 111 Broad St., Providence, R. I., OALR
Lehan, J. W. ..... Greeley, Colo., OALR
Lemere, H. B. ..... Brandeis Bldg., Omaha, Neb., OALR
Lenker, John N. ..... Osborn Bldg., Cleveland, O., ALR
Lent, E. J. ..... 122 North Lafayette Blvd., South Bend, Ind., OALR
Lester, H. S. ..... 219 East Main St., Streator, Ill., OALR
Levy, L. ..... Bank of Commerce Bldg., Memphis, Tenn., OALR
Levy, R. ..... Metropolitan Bldg., Denver, Colo., ALR
Lewis, A. C. ..... Exchange Bldg., Memphis, Tenn., OALR
Lewis, F. P. ..... 454 Franklin St., Buffalo, N. Y., Op.
Lewis, G. G. ..... University Blk., Syracuse, N. Y., OALR
Lewis, J. D. ..... 516 LaSalle Bldg., Minneapolis, Minn.
Lewis, J. P. ..... 543 Boylston St., Boston, Mass., ALR
Lewitt, F. C. ..... 408 Butler Bldg., San Francisco, Cal., OAL
Libby, George F. ..... Majestic Bldg., Denver, Colo., Op.
Lichtenberg, J. S. ..... Rialto Bldg., Kansas City, Mo., Op.
Lindsay, D. M. ..... Boston Bldg., Salt Lake City, Utah, OALR
Linn, E. G. ..... Flemming Bldg., Des Moines, Ia., OALR
Linn, Jay G. ..... 820 Highland Bldg., Pittsburgh, Pa.
Lintleman, F. R. ..... 312 Hayes Block, Janesville, Wis., OALR
Lischkoff, M. A. ..... Blount Bldg., Pensacola, Fla., OALR
Litchfield, J. T. ..... 601 Phys. & Surgeons Bldg., Minneapolis, Minn.
Little, A. H. ..... 188 State St., Portland, Me., Op.

*Died.

Lloyd, A. W.....504 Hammond Bldg., Hammond, Ind., OALR
Lockard, L. B.....Metropolitan Bldg., Denver, Colo., ALR
Loeb, C.....25 East Washington St., Chicago, Ill., Op.
Loeb, H. W.....537 North Grand Ave., St. Louis, Mo., ALR
Lokey, H. M.....Candler Bldg., Atlanta, Ga., OALR
Loomis, E. A.....Donaldson Bldg., Minneapolis, Minn., OALR
Lorie, A.....Commerce Bldg., Kansas City, Mo., ALR
Loring, J. B.....25 East Washington St., Chicago, Ill., OALR
Louchery, D. C.....214 West Main St., Clarksburg, W. Va., OALR
Love, L. F.....1305 Locust St., Philadelphia, Pa., Op.
Lowell, W. H.....101 Newbury St., Boston, Mass., Op.
Lubman, Max.....616 Madison Ave., New York City, N. Y.
Lukens, Charles.....218 Michigan St., Toledo, O., OALR
Lutz, S. H.*.....284 Hancock St., Brooklyn, N. Y., ALR
Lynah, H. L.....127 West 58th St., New York City, N. Y., OALR
Lynch, R. C.....634 Maison Blanche Bldg., New Orleans, La., ALR

Macfarlan, D.....1805 Chestnut St., Philadelphia, Pa., OALR
Macfarlane, P. B.....152 St. James St., S., Hamilton, Can., OALR
Macine, J. S.....503 Donaldson Bldg., Minneapolis, Minn.,
Madden, Reed.....Allen Bldg., Xenia, O., OALR
Magee, R. S.....Mills Bldg., Topeka, Kan., Op.A
Magruder, A. C.....Burns Bldg., Colorado Springs, Colo., OALR
Maide, A. B.....Shreveport, La.
Maiden, S. D.....Citizens Natl. Bank Bldg., Council Bluffs, Ia.
Maire, L. E.....Park Bldg., Detroit, Mich., Op.A
Mann, R. H. T.....State Natl. Bank Bldg., Texarkana, Tex., OALR
Mansur, D. W.....Brockman Bldg., Los Angeles, Cal., Op.
Markel, J. C.....Westinghouse Bldg., Pittsburgh, Pa., Op.
Marquis, G. P.....30 North Michigan Blvd., Chicago, Ill., ALR
Marshall, J. P.....Stone Bldg., Warren, O., OALR
Marshall, W. .....Diamond Bank Bldg., Pittsburgh, Pa., ALR
Martin, H. H.....247 Bull St., Savannah, Ga., OALR
Martin, W. A.....City of Paris Bldg., San Francisco, Cal., OALR
Mason, A. B.....Burns Bldg., Waycross, Ga., OALR
Matheny, R. C.....306 E. Main St., Galesburg, Ill., OALR
Matheson, J. P.....Realty Bldg., Charlotte, N. C., OALR
Matthews, J.....Metropolitan Bldg., Minneapolis, Minn., LR
Mauldin, L. O.....Wallace Bldg., Greenville, S. C., OALR
Maumenee, A. E.....156 St. Francis St., Mobile, Ala., OALR
Mauer, J.....Marion Natl. Bank Bldg., Marion, Ind., OALR
Maxey, E. E.....Idaho Bldg., Boise City, Idaho, OALR
May, C. H.....698 Madison Ave., New York City, N. Y., Op.
May, J. V.....1st Natl. Bank Bldg., Marinette, Wis., OALR
Maybaum, J. E.....17 East 38th St., New York City, N. Y., ALR
Mayer, E.....40 East 41st St., New York City, N. Y., ALR
Meanor, Wm. C.....Keenan Bldg., Pittsburgh, Pa.
Means, C. S.....131 East State St., Columbus, O., OALR
Meierhof, E. L.....1140 Madison Ave., New York City, N. Y., OALR
Mercer, R. E.....David Whitney Bldg., Detroit, Mich., LR
Merrill, H. G.....230 West 4th St., Provo, Utah,
Merrill, W. H.....The Bay State Bldg., Lawrence, Mass., OALR
Messinger, H. C.....170 Broad St., Providence, R. I., Op.
Metz, R. B.....Guardian Bldg., Cleveland, O., Op.
Metzenbaum, M.....Rose Bldg., Cleveland, O., ALR
Michie, W. T.....1317 Central Bank Bldg., Memphis, Tenn., OALR
Middleton, A. B.....Pontiac, Ill., OALR
Miller, Alice R.....West Palm Beach, Fla.
Miller, C. M.....3 West Grace St., Richmond, Va., OALR
Miller, C. E.....315 South Jefferson, Muncie, Ind., OALR
Miller, E. B.....2028 Chestnut St., Philadelphia, Pa.

*Died.

Millette, J. W. ..... Reibold Bldg., Dayton, O., OALR
Miner, S. C. ..... 270 Woodward Ave., Detroit, Mich., ALR
Minor, C. L. ..... Fairbanks Bldg., Springfield, O., OALR
Minor, H. F. ..... Randolph Bldg., Memphis, Tenn., OALR
Mitchell, E. K. ..... 710 W. Lehigh Ave., Philadelphia, Pa., OLR
Mitchell, F. W. ..... Fogg Blk., Houlton, Me., OALR
Mithoefer, W. ..... 19 West 7th St., Cincinnati, O., ALR
Mittendorf, A. D. ..... 399 Park Ave., New York City, N. Y., Op.
Mittendorf, W. K. ..... 115 East 53rd St., New York City, N. Y., Op.A
Molt, W. F. ..... Newton Claypool Bldg., Indianapolis, Ind., ALR
Monaghan, D. G. ..... Metropolitan Bldg., Denver, Colo., Op.
Monahan, J. A. ..... 181 Chestnut St., Clinton, Mass., OALR
Monosmith, O. B. ..... 424 Broadway, Lorain, O., OALR
Monson, S. H. ..... Ainsfield Bldg., Cleveland, O., OALR
Moore, F. B. ..... Exchange Bldg., Memphis, Tenn., OALR
Moore, G. A. ..... Bank Bldg., Palmer, Mass., OALR
Moore, M. ..... The Rochambeau, Washington, D. C., ALR
Moore, T. W. ..... First Natl. Bank Bldg., Huntington, W. Va., OALR
Morgan, J. A. ..... Young Bldg., Honolulu, T. Hawaii, OALR
Morris, A. G. ..... 41 Gibbs St., Rochester, N. Y.
Morrison, F. A. ..... Willoughby Bldg., Indianapolis, Ind., Op.
Morse, A. W. ..... 507 Phoenix Blk., Butte, Mont.
Morse, J. A. ..... 503 Donaldson Bldg., Minneapolis, Minn.
Morsman, L. W. ..... 203 Congdon Bldg., Hibbing, Minn.
Mortimer, W. G. ..... 58 Central Park, W., New York City, N. Y., OALR
Mosher, H. P. ..... 828 Beacon St., Boston, Mass., ALR
Moss, R. E. ..... Hicks Bldg., San Antonio, Tex., OALR
Moulton, H. ..... Merchants Natl. Bank Bldg., Ft. Smith, Ark., OALR
Mullin, W. V. ..... Burns Bldg., Colorado Springs, Colo., ALR
Muncaster, S. B. ..... 921, 15 A St., Washington, D. C., OPA
Muncy, W. M. ..... 23 Waterman St., Providence, R. I., OALR
Mundt, G. H. ..... 25 East Washington St., Chicago, Ill., OALR
Munson, D. O. ..... Globe Bldg., Pittsburg, Kan., OALR
Murdoch, J. F. ..... Bessemer Bldg., Pittsburgh, Pa., Op.
Murphy, F. G. ..... Mason City, Ia., OALR
Murphy, J. G. ..... Wilmington, N. C.
Murphy, J. W. ..... Union Central Life Bldg., Cincinnati, O., OALR
Murphy, W. E. ..... 7th and Race Sts., Cincinnati, O., OALR
Murray, W. R. ..... Phys. and Surgeons Bldg., Minneapolis, Minn., OALR
McAlister, J. C. ..... Ridgeway, Pa., OALR
McBride, W. O. ..... 218 Washington Blvd., W., Ft. Wayne, Ind., OALR
McCaskey, C. H. ..... Amer. Cent. Life Bldg., Indianapolis, Ind., ALR
McCaw, John A. ..... 418 Majestic Bldg., Denver, Colo.
McClellend, L. A. ..... 78 McDonough St., Brooklyn, N. Y., ALR
McCool, J. L. ..... Stevens Bldg., Portland, Ore., Op.
McCoy, J. ..... 157 West 73rd St., New York City, N. Y., ALR
McCready, J. H. ..... Empire Bldg., Pittsburgh, Pa., ALR
McCulloch, R. J. P. ..... 102 College St., Toronto, Can.
McDiarmid, H. O. ..... Rossner Ave. and 9th St., Brandon, Manitoba, Can., OALR
McDonald, C. L. ..... 432 Ainsfield Bldg., Cleveland, O.
McDowell, N. D. ..... 355 East Ave., Rochester, N. Y., OALR
McGuire, H. H. ..... 227 West Water St., Winchester, Va., OALR
McHenry, D. D. ..... 301 Colcord Bldg., Oklahoma City, Okla., OALR
McKee, C. W. ..... Greensburg, Pa., OALR
McKee, S. H. ..... 158 Crescent St., Montreal, Can., OpA
McKelvey, A. D. M. ..... 160 Bloor St., Toronto, Can., ALR
McKennan, J. W. ..... Washington Trust Bldg., Washington, Pa.
McLachlan, A. A. ..... Empire Bldg., Pittsburgh, Pa., ALR
McLemore, T. ..... Nevada, Mo., OALR
McKeown, E. E. ..... Metropolitan Bldg., Denver, Colo., OALR
McMurray, J. B. ..... Washington, Pa., OALR
McNaught, H. ..... Butler Bldg., San Francisco, Cal., ALR

McReynolds, G. S.....State Bank Bldg., Temple, Tex., OALR
McReynolds, J. O.....Trust Bldg., Dallas, Tex., OALR

Nadeau, E. G.....Bellin-Buchanan Bldg., Green Bay, Wis., OALR
Naftzger, J. B.....Davidson Bldg., Sioux City, Ia., OALR
Nance, W. O.....30 North Michigan Blvd., Chicago, Ill., OALR
Neeper, E. R.....Ex. Natl. Bk. Bldg., Colorado Springs, Colo., Op
Nelson, C. F.....Schofield Bldg., Cleveland, Ohio.
Nelson, L. A.....Lowry Arcade, St. Paul, Minn., Op.A
Newcomb, J. R.....Hume-Mansur Bldg., Indianapolis, Ind., Op.
Newhart, H.....Donaldson Bldg., Minneapolis, Minn., OALR
Newell, W. S.....1424 K St., Washington, D. C.
Nisselson, Max.....616 Madison Ave., New York City, N. Y.
Noble, W. L.....32 North State St., Chicago, Ill., OALR
Norris, S. C.....16 West 10th St., Anderson, Ind.
Norton, C. E.....118 Lisborn St., Lewiston, Me., Op.A
Norton, Roy R.....Masonic Bldg., Brighton, Pa.
Novak, Frank J.....30 North Michigan Blvd., Chicago, Ill., ALR
Noyes, G. L.....Columbia, Mo., OALR
Nutter, C. F.....16 Amherst St., Nashua, N. H., Op.
Nye, F. T.....410 E. Grand Ave., Beloit, Wis., OALR

O'Brien, S. A.....Mason City, Ia., OALR
Oberg, C. M.....Syndicate Bldg., Minneapolis, Minn., OALR
O'Connor, F. O.....State Mutual Bldg., Worcester, Mass.
O'Connor, R. P.....1206 Broadway, Oakland, Cal., Op.
Odell, A.....32 Adams St., Detroit, Mich., Op.AL
Oertel, T. E.....Augusta, Ga., OALR
Offutt, W. N.....Security Bldg., Lexington, Ky., OALR
O'Gwynn, J. C.....Van Antwerp Bldg., Mobile, Ala.
Oppenheimer, S.....45 East 60th St., New York City, N. Y., OALR
Orcut, D. C.....7 West Madison Ave., Chicago, Ill., OpA
O'Reilly, C. A.....1806 Chestnut St., Philadelphia, Pa., ALR
O'Reilly, W. F.....44 South Common St., Lynn, Mass., OALR
Orendorf, Otis.....Cañon City, Colo., OALR
Orton, H. B.....671 Broad St., Newark, N. J., ALR
Overman, F. V.....Hume-Mansur Bldg., Indianapolis, Ind., ALR
Owen, F. S.....Brandeis Bldg., Omaha, Neb., OALR

Page, I.....Hume-Mansur Bldg., Indianapolis, Ind.
Painter, A. M.....Sharp Bldg., Kansas City, Mo.
Park, J. W.....32 North Second St., Harrisburg, Pa., OALR
Parker, E. H.....LaSalle Bldg., Minneapolis, Minn., LR
Parker, W. R.....32 Adams St., Detroit, Mich., Op.
Parsons, J. G.....Paulton Bldg., Sioux Falls, S. D., OALR
Pattee, J. J.....Thatcher Bldg., Pueblo, Colo., OALR
Patterson, E. J.....Westinghouse Bldg., Pittsburgh, Pa.
Patterson, J. A.....Burns Bldg., Colorado Springs, Colo., OALR
Patterson, W. E.....808 Mary Place, Minneapolis, Minn.
Patton, J. M.....Brandeis Bldg., Omaha, Neb., OALR
Payne, A. L.....Opera House Blk., Eau Claire, Wis., OALR
Payne, S. M.....542 Fifth Ave., New York City, N. Y., OALR
Pearson, W. W.....Equitable Bldg., Des Moines, Ia., OALR
Pendleton, F. M.....5th and Hampshire Sts., Quincy, Ill., OALR
Peter, Luther C.....1527 Spruce St., Philadelphia, Pa., Op.
Peterman, H. E.....518 North Charles St., Baltimore, Md., OALR
Pfafflin, C. A.....Newton Claypool Bldg., Indianapolis, Ind., OALR
Pfingst, A. O.....Atherton Bldg., Louisville, Ky., OALR
Pfingsten, C. F.....508 North Grand Ave., St. Louis, Mo., ALR
Pfister, F.....Majestic Bldg., Milwaukee, Wis., ALR
Phillips, W. C.....40 West 47th St., New York City, N. Y., ALR
Phillips, W. L.....449 Franklin St., Buffalo, N. Y., Op.
Phinney, F. D.....22 West 7th St., Cincinnati, O., OALR

Pifer, J. D.....Frisco Bldg., Joplin, Mo., OALR
Pitkin, C. E.....Osborn Bldg., Cleveland, O., ALR
Pollock, H. L.....2551 North Clark St., Chicago, Ill., ALR
Pontius, P. J.....1831 Chestnut St., Philadelphia, Pa., OALR
Porter, E. H.....85 Madison, Tiffin, O., OALR
Porter, L. B.....117 Waterman St., Providence, R. I., OALR
Post, Martin H.....520 Metropolitan Bldg., St. Louis, Mo., Op.
Potter, L. F.....278 Union St., New Bedford, Mass., OALR
Potter, Peter.....44 Hennessy Bldg., Butte, Mont., OALR
Potts, J. B.....Brandeis Bldg., Omaha, Neb., Op.
Powers, E.....Central Natl. Bank Bldg., Carthage, Mo., OALR
Pratt, F. J., Jr.....Metropolitan Bank Bldg., Minneapolis, Minn., OALR
Pratt, J. A. .....Metropolitan Bank Bldg., Minneapolis, Minn.
Prendergast, D.....1110 Euclid Ave., Cleveland, O.
Price, N. W.....Niagara Falls, N. Y.
Prout, A. W.....239 East Town St., Columbus, O., OALR
Putnam, F. I.....Boyce-Greeley Bldg., Sioux Falls, S. D., OALR
Pyfer, H. F.*.....131 West Main St., Norristown, Pa., OALR
Pyle, W.....612 Berger St., Jersey City, N. J., OALR

Quittner, S. S.....5512 Woodland Ave., Cleveland, O., OALR

Ralls, C. T.....First Natl. Bank Bldg., Winfield, Kan., OALR
Ralston, Wallace W.....417 Kress Bldg., Houston, Tex., Op.
Ravdin, B. D. .....Evansville, Ind., OALR
Ravdin, M.....223 Main St., Evansville, Ind., OALR
Ray, J. M.....Atherton Bldg., Louisville, Ky.
Ray, V.....The Croton., Cincinnati, O., OALR
Reaves, W. P.....Greensboro, N. C., OALR
Rebuck, C. S.....412 North Third St., Harrisburg, Pa., OALR
Rector, A. E.....789 College Ave., Appleton, Wis., OALR
Reeder, J. E.....Davidson Bldg., Sioux City, Ia., OALR
Reese, R. G.....50 West 52nd St., New York City, N. Y., Op.
Reger, H. S.....New Wellman Bldg., Jamestown, N.Y., OALR
Reiche, O. C.....328 West Broad St., Hazelton, Pa., OALR
Remmens, N. .....31 North State St., Chicago, Ill., Op.
Renaud, G. L.....Fine Arts Bldg., Detroit, Mich., OALR
Renner, W. S.....341 Linwood Ave., Buffalo, N. Y., ALR
Reyling, F. T.....1220 Rialto Bldg., Kansas City, Mo., Op.
Reynolds, H. G.....Natl. Bank Bldg., Paducah, Ky., Op.A
Reynolds, J. D.....816 LaSalle Bldg., Minneapolis, Minn.
Rice, G. B.....220 Clarendon Ave., Boston, Mass., ALR
Rice, R. H.....Coshwell Bldg., Milwaukee, Wis., Op.AL
Richardson, C. W.....1317 Connecticut Ave., Washington, D. C., ALR
Richardson, J. J.....1509 Ave. of Presidents, Washington, D. C., ALR
Richie, L. T.....Trinidad, Colo., OALR
Rideout, W. J.....90 Stephenson St., Freeport, Ill., OALR
Ridpath, R. F.....1928 Chestnut St., Philadelphia, Pa., ALR
Ringle, C. A.....Coronado Bldg., Greeley, Colo., ALR
Ringueberg, E. N. S.....15 Main St., Lockport, N. Y., Op.
Roberts, W. H.....461 East Colorado St., Pasadena, Cal., OALR
Roberts, S. E.....Waldheim Bldg., Kansas City, Mo., ALR
Robertson, E. N.....132½ W. 6th St., Concordia, Kan.
Robertson, C. M.....Michigan Blvd. Bldg., Chicago, Ill., OALR
Robertson, F. D.....Ashton Bldg., Grand Rapids, Mich., OALR
Robinson, H. T.....Cumberland, Md.
Robinson, J. R.....The Colchester, Colorado Springs, Colo., OALR
Rochow, C. J. F.....1612 Twenty Second St., Rock Island, Ill.
Rogers, A. S.....105 S. Jefferson Ave., Saginaw, Mich., OALR
Rogers, B. F.....222 Franklin St., Buffalo, N. Y., Op.A
Rogers, J. T.....464 Union Ave., Montreal, Can., ALR

*Died.

Rogers, W. K.....188 East State St., Columbus, O., OALR
Roller, L. A.....122 Monroe St., Grand Rapids, Mich., OALR
Roost, F. H.....Sioux City, Ia., OALR
Rosenbaum, J.....36 Sherbrook St., W., Montreal, Can.
Rott, O. M.....Paulsen Bldg., Spokane, Wash., OALR
Row, G. S.....Hume-Mansur Bldg., Indianapolis, Ind., Op.
Rowland, J. F.....Thompson Bldg., Hot Springs, Ark., OALR
Rubendall, C.....Brandeis Bldg., Omaha, Neb., OALR
Ruby, F. M.....Union City, Ind.
Rucker, E. W., Jr.....Birmingham, Ala., ALR
Russell, E. R.....Legol Bldg., Asheville, N. C., OALR
Rust, E. G.....Lennox Bldg., Cleveland, O., Op.A
Ryan, L. R.....San Marcos Bldg., Santa Barbarba, Cal., Op.A
Ryder, D. R.....151 Rock St., Fall River, Mass., ALR

Sanderson, D. D.....Funke Bldg., Lincoln, Neb., OALR
Sanderson, H. H.....David Whitney Bldg., Detroit, Mich., OALR
Satterlee, R. H.....187 Delaware Ave., Buffalo, N. Y, Op.
Sauer, W. E.....Humboldt Bldg., St. Louis, Mo., ALR
Sauer, W. W.....St. Clair Bldg., Marietta, O., OALR
Savage, G. C.....137, 8th Ave., N., Nashville, Tenn., Op.
Savage, G. H.....Central Bank Bldg., Memphis, Tenn., OALR
Sawtell, J. E.....Waldheim Bldg., Kansas City, Mo., ALR
Scales, J. L.....Commercial Bank Bldg., Shreveport, La., OALR
Scales, J. W.....202½ Main St., Pine Bluff, Ark., OALR
Scarlett, Hunter W.....2228 Locust St., Philadelphia, Pa.
Schaeffer, G. C.....112 East Broad St., Columbus, O., OALR
Schaffert, N. L.....57 S. Washington St., Wilkes-Barre, Pa., OALR
Schenck, W. E.....19 West 7th St., Cincinnati, O., OALR
Schild, E. H.....Cleveland Ave. and 9th St., Canton, O., Op.A
Schiller, A. Noah.....1855 7th Ave., New York City, N. Y., ALR
Schlegel, H. T.....501 Third St., Wausau, Wis.
Schlindwein, G. W.....138 West 9th St., Erie, Pa., OALR
Schneidemann, T. B.....Professional Bldg., Philadelphia, Pa., Op
Schoenberg, M. J.....108 East 31st St., New York City, N. Y., Op.
Scholz, P. R.....Metropolitan Bldg., St. Louis, Mo., ALR
Schrant, J. H.....Hutchinson, Kan., OALR
Schultz, W. H.....712 Bryant Bldg., Kansas City, Mo.
Schweinitz, Geo. E. de.....1705 Walnut St., Philadelphia, Pa., Op.
Schwenk, P. N. K.....1417 North Broad St., Philadelphia, Pa. Op.
Scott, B. L.....Provident Bldg., Waco, Tex., OALR
Scroggs, J. J.....218 East Third St., Beaver, Pa.
Searcy, H. B.....807 Greensboro Ave., Tuscaloosa, Ala., OALR
Sears, Wm. H.....514 Penn St., Huntington, Pa., OALR
Seay, D. E.....Trust Bldg., Dallas, Tex., OALR
Sedgwick, O. W.....Princeton, W. Va.
Sedwick, W. A.....Metropolitan Bldg., Denver, Colo., OALR
Seegman, S.....Jenkins Arcade Bldg., Pittsburgh, Pa., ALR
Selfridge, G. L.....Schroth Bldg., San Francisco, Cal., ALR
Sewall, E. C.....Lane Hospital, San Francisco, Cal., OALR
Seydell, E. M.....201 North Main St., Wichita, Kan., ALR
Shackleton, W. E.....Osborn Bldg., Cleveland, O., Op.
Shafer, J. J.....Stark Bldg., Louisville, Ky., OALR
Shahan, W. E.....Metropolitan Bldg., St. Louis, Mo., Op.
Shanahan, T. J.....419 Boylston St., Boston, Mass., ALR
Shanklin, E. M.....575 Hohman St., Hammond, Ind., OALR
Shannon, C. E.....1633 Spruce St., Philadelphia, Pa., Op.
Shapero, I. M.....18 Gibbs St., Rochester, N. Y.
Sharp, W. N.....Hume-Mansur Bldg., Indianapolis, Ind., Op.
Shastid, T. H.....1920 Johns Ave., Superior, Wis., OALR
Shea, J. J.....Exchange Bldg., Memphis, Tenn., OALR
Shellman, J. L.....Lowry Bldg., St. Paul, Minn., OALR
Sherman, A. E.....108 Main St., Aurora, Ill., OALR

Sherman, E. S.....67 Broad St., Newark, N. J., OALR
Shields, J. M.....Metropolitan Bldg., Denver, Colo., OALR
Shoemaker, W. A.....Carleton Bldg., St. Louis, Mo., Op.
Shoemaker, S. A.....416 W. Washington St., Bluffton, Ind., OALR
Short, Z. N.....Dugan Stuart Bldg., Hot Springs, Ark., OALR
Shreve, O. M.....162 West 8th St., Erie, Pa., OALR
Shuman, G. H.....East End Trust Bldg., Pittsburgh, Pa., Op.
Shurly, B. R.....32 West Adams St., Detroit, Mich., ALR
Shute, D. K.....1717 De Sales, Washington, D. C., Op.
Simonds, O. F.....536 Rose Bldg., Cleveland, O., Op.
Simpson, W. L.....Exchange Bldg., Memphis, Tenn., OALR
Singleton, E. M.....111 East Church St., Marshalltown, Ia., OALR
Skillern, R. H.....2032 Chestnut St., Philadelphia, Pa., LR
Sleight, R. D.....Post Bldg., Battle Creek, Mich., OALR
Sloan, Henry L.....612 McBain Bldg., Roanoke, Va.
Slocum, G. .....311 South State St., Ann Arbor, Mich., Op.
Sluder, G.....3542 Washington Ave., St. Louis, Mo., ALR
Smith, D. .....834 Myrtle Ave., Bridgeport, Conn., Op.A
Smith, D. S.....La Crosse, Wis.
Smith, E. T.....Connecticut Mut. Bldg., Hartford, Conn., OALR
Smith F. K.....121 Mahoning Ave., Warren, O., OALR
Smith, G. B.....Broad St. and Fourth Ave., Rome, Ga., OALR
Smith, H. A.....640 Main St., Delta, Colo., OALR
Smith, H. E.....178 Broad St., Norwich, N. Y., OALR
Smith, J. F.....86 Post St., San Francisco, Cal., OALR
Smith, R. C.....Board of Trade Bldg., Superior, Wis., OALR
Smith, S. McC.....1429 Spruce St., Philadelphia, Pa., ALR
Smith, S. S.....Jenkins Arcade Bldg., Pittsburgh, Pa., Op.
Smith, V. C.....Maison Blanche Bldg., New Orleans, La., Op
Snow, L. W.....Deseret Bank Bldg., Salt Lake City, Utah, OALR
Snyder, W. H.....211 Ontario St., Toledo, O., OALR
Sonnenschein, R.....Heyworth Bldg., Chicago, Ill., ALR
Spalding, J. A.....627 Congress St., Portland, Me., OpA
Spencer, F. R.....Physicians Bldg., Boulder, Colo., OALR
Spencer, W. .....1830 South Rittenhouse Sq., Philadelphia, Pa., OALR
Spengler, J. A.....Masonic Temple, Geneva, N. Y., OALR
Spiece, W. K.....Heyworth Bldg., Chicago, Ill., OALR
Spitze, E. C.....Murphy Bldg., East St. Louis, Ill., Op.
Spohn, G. W.....130 W. Franklin St., Elkhart, Ind., OALR
Stanberry, H. .....8 East 8th St., Cincinnati, O., OpAR
Standish, M. .....72 St. James St., Boston, Mass., Op.
Stanford, J. B.....Exchange Bldg., Memphis, Tenn., OALR
Starkey, H. M.....William Brown Bldg., Rockford, Ill., OALR
Starr, E. G.....523 Delaware Ave., Buffalo, N. Y., Op.
Stauffer, F. .....Templeton Bldg., Salt Lake City, Utah, OALR
Stegman, L. B.....56 Manchester St., Battle Creek, Mich.
Stein, J. M.....New Kensington, Pa., Op.
Stein, O. J.....77 East Washington St., Chicago, Ill., ALR
Steuber, F. G.....Main and North Sts., Lima, O., OALR
Stevens, G. T.....350 West 88th St., New York City, N. Y., Op.
Stevens, H. B.....522 Commonwealth St., Boston, Mass., Op.
Stevenson, R. .....22 West 7th St., Cincinnati, O., ALR
Stevenson, W. D.....165 E. Market St., Akron, O., OALR
Stevenson, W. D.....Majestic Bldg., Quincy, Ill., OALR
Stewart, C. C.....Auburn, Ind., OALR
Stewart, J. R.....2061 East 96th St., Cleveland, O.
Stierin, E. .....626 Union Arcade Bldg., Pittsburgh, Pa., Op.
Stiles, C. M.....1831 Chestnut St., Philadelphia, Pa., Op.
Stilwill, H. R.....Metropolitan Bldg., Denver, Colo., Op.
Stillson, H. .....Northern Bank Bldg., Seattle, Wash., OALR
Stinson, George W.....Jenkins Arcade Bldg., Pittsburgh, Pa.
Stockler, J. A.....249 North Fifth St., Reading, Pa., OALR
Stotter, J. .....1148 Euclid Ave., Cleveland, O., OALR

Stout, G. C. .....1611 Walnut St., Philadelphia, Pa., AL
Strader, G. L.....First National Bank Bldg., Cheyenne, Wyo., OALR
Stricker, L. .....The Groton, Cincinnati, O., Op.
Strickland, D. A.....Empire Bldg., Denver, Colo.
Strong, J. C.....American Natl. Bank Bldg., Leadville, Colo., OALR
Strouse, A. N.....132 West 58th St., New York City, N. Y., OALR
Strout, E. S. .....Donaldson Bldg., Minneapolis, Minn.
Strout, G. Elmer .....Donaldson Bldg., Minneapolis, Minn.
Stuart, C. C.....Guardian Bldg., Cleveland, O., Op.
Stuber, P. J.....209 West North St., Lima, O., OALR
Stucky, J. A.....Fayette Natl. Bank Bldg., Lexington, Ky., OALR
Stucky, W. S.....McClelland Bldg., Lexington, Ky., OALR
Sturges, L. F.....128 West 87th St., New York City, N. Y., LR
Sturm, S. A.....Jenkins Arcade Bldg., Pittsburgh, Pa., Op.
Suffa, G. A.....Gulford Hall, Boston, Mass., Op.
Suker, G. F.....25 E. Washington St., Chicago, Ill., Op.
Sulzer, G. A.....237 East State St., Columbus, O., OALR
Sutphen, T. Y.....997 Broad St., Newark, N. J., Op.
Swan, C. J.....The Globe Bldg., Chicago, Ill., OALR
Sweet, W. M.....1205 Spruce St., Philadelphia, Pa., Op.
Swetman, C. R. K.....Brockman Bldg., Los Angeles, Cal., ALR

Tangeman, Chas. W.....19 West 7th St., Cincinnati, O., Op.
Tangeman, H. F.....607 Central Bldg., Cincinnati, O.
Tarun, W.....605 Park Ave., Baltimore, Md., Op.A
Taylor, L. E.....Marshall Field Annex Bldg., Chicago, Ill., ALR
Taylor, L. H.....83 South Franklin St., Wilkes-Barre, Pa., OALR
Taylor, M. C.....415 Warrington Ave., Pittsburgh, Pa.
Teal, F. F.....Richards Blk., Lincoln, Neb., OALR
Thiell, J. E.....Belvidere, Ill.
Thigpen, C. A.....First Natl. Bank Bldg., Montgomery, Ala., OALR
Thomas, Chas. D.....Central Natl. Bank Bldg., Peoria, Ill., OALR
Thomas, H. G.....Dalziel Bldg., Oakland, Cal.
Thomason, H. E.....Rialto Bldg., Kansas City, Mo., OALR
Thomasson, W. J.....942 York St., Newport, Ky.
Thompson, G. H.....18 Ashland St., North Adams, Mass., OALR
Thompson, H. M.....First Natl. Bank Bldg., Pueblo, Colo., Op.
Thompson, P. H.....308 Commonwealth Ave., Boston, Mass., Op.
Thomson, E. H.....19 West 7th St., Cincinnati, O., OALR
Thomson, J. J.....40 West 47th St., New York City, N. Y., OALR
Tilderquist, D. L.....7 East Superior St., Duluth, Minn.
Timberman, A.....112 East Broad St., Columbus, O., OALR
Tindolph, L. F.....Olian, N. Y., OALR
Tingley, L. P.....9 Massachusetts Ave., Boston, Mass., Op.
Tiven, R. J.....104 South Michigan Blvd., Chicago, Ill., OALR
Tobey, G. I.....416 Marlborough St., Boston, Mass., ALR
Tomlin, W. S.....Hume-Mansur Bldg., Indianapolis, Ind., ALR
Toms, S. W.....Nyack, N. Y., OALR
Tooker, C. W.....Carleton Bldg., St. Louis, Mo., Op.
Tripp, Ira A.....436 Rose Bldg., Cleveland, O.
Tuckerman, W. C.....Osborn Bldg., Cleveland, O., Op.
Tuckerman, W. H.....Osborn Bldg., Cleveland, O., OALR
Tull, F. E.....State Natl. Bank Bldg., Alberquerque, N. M., OALR
Turnbull, F. M.....504 Providence Bldg., Duluth, Minn.
Turner, H. H.....Jenkins Arcade Bldg., Pittsburgh, Pa., Op.
Turner, O. W.....Augusta Trust Bldg., Augusta, Me., OALR
Tuttle, E. R.....320 Twelfth St., Miami, Fla., OALR
Twitty, W. E.....Rockhill, S. C.
Tydings, O.....31 North State St., Chicago, Ill., OALR

Upham, H. F.....305, 3d Ave., Asbury Park, N. J., OALR
Urner, M. H.....Union Central Life Bldg., Cincinnati, O., OALR

Vail, D. T.....24 East 8th St., Cincinnati, O., OALR
Valk, F.*.....164 East 61st St., New York City, N. Y., Op.
Vankirk, V. E.....Union Arcade Bldg., Pittsburgh, Pa., Op.
Van Note, W. B.*.....Opera House Block, Lima, O., OALR
Vaughn, Edgar H.....Tyler, Tex.
Vaughn, G. E.....Clarksville, Tenn., OALR
Veasey, C. A.....Paulsen Bldg., Spokane, Wash., OALR
Vinsonhaler, F.....Urquhart Bldg., Little Rock, Ark., OALR
Voight, C. B.....1702 Broadway, Mattoon, Ill., OALR
Von Colditz, G. F.....25 East Washington St., Chicago, Ill., OALR
Voohees, I. W.....14 Central Park, W., New York City, N. Y., ALR

Wagner, C. B.....31 North State St., Chicago, Ill., OALR
Wagner, H. L.....518 Sutter St., San Francisco, Cal., ALR
Wales, E. de Wolf.....Hume-Mansur Bldg., Indianapolis, Ind., ALR
Walker, C. E.....Jacobson Bldg., Denver, Colo.
Walker, H. S.....910 Michigan Blvd. Bldg., Chicago, Ill., OALR
Wallace, F. E.....517 Thatcher Bldg., Pueblo, Colo., OALR
Walter, Wm.....31 North State St., Chicago, Ill., OALR
Ward, P. M.....Dunn Furniture Blk., Houlton, Me., OALR
Warfield, C.....20 Hicks Bldg., San Antonio, Tex., OALR
Watson, H. D.....151 Front St., Binghampton, N. Y., OALR
Watson, H. J.....222 Portage Ave., Winnipeg, Manitoba, Canada, ALR
Waugh, J. M.....Cleveland, O.
Weaver, T. W.....105 West Douglas, Wichita, Kan., Op.
Webster, D.....24 East 48th St., New York City, N. Y., Op.A
Webster, R. M.....663 Reibold Bldg., Dayton, O.
Weed, H. M.....405 Franklin St., Buffalo, N. Y., Op.
Weimer, E. S.....332 Lehigh Ave., Pittsburgh, Pa., Op.
Weinstein, J.....261 Central Park, W., New York City, N. Y., ALR
Weisser, E. A.....Empire Bldg., Pittsburgh, Pa., Op.
Weil, A. L.....Title Guarantee Bldg., New Orleans, La., ALR
Wells, D. W.....Hotel Westminster, Boston, Mass., Op.
Wells, G. S.....San Marcos Bldg., Santa Barbara, Cal., ALR
Wells, W. A.....The Rochambeau, Washington, D. C., OALR
Welsh, D. E.....Powers Theater Bldg., Grand Rapids, Mich., OALR
Welty, C. F.....Shreve Bldg., San Francisco, Cal., ALR
Wencke, C. G.....16 Wentworth Court, Battle Creek, Mich.
Werts, C. M.....Equitable Bldg., Des Moines, Ia., OALR
Westcott, C. D.....22 East Washington, Chicago, Ill., Op.
Whaley, E. M.....1430 Blanding St., Columbia, S. C., OALR
Wheeler, John M.....80 West 40th St., New York City, N. Y.
Wherry, W. P.....Brandeis Theater Bldg., Omaha, Neb., OALR
Whitaker, J.....Hume-Mansur Bldg., Indianapolis, Ind., OALR
White, E. H.....589 Dorchester St., Montreal, Can., ALR
White, L. E.....390 Commonwealth Ave., Boston, Mass., ALR
Whisnant, A. M.....Realty Bldg., Charlotte, N. C., OALR
Wible, E. E.....Diamond Bank Bldg., Pittsburgh, Pa., Op.
Wilbur, E. P.....Kalamazoo Natl. Bank Bldg., Kalamazoo, Mich., OALR
Wiener, A.....550 Park Ave., New York City, N. Y., OALR
Wiener, M.....Carleton Bldg., St. Louis, Mo., Op.
Wilder, W. H.....122 S. Michigan Blvd., Chicago, Ill., Op.
Wilkowske, C. W.....Union Blk., Chippewa Falls, Wis.
Williard, L. M.....Wausau, Wis.
Willetts, J. E.....Jenkins Arcade Bldg., Pittsburgh, Pa.
Williams, J. P.....Lincoln, Neb.
Williams, Thomas J.....30 N. Michigan Blvd., Chicago, Ill.
Williams, W. C.....Jefferson Bldg., Peoria, Ill.
Wilson, R. C.....208 East State St., Ithaca, N. Y., OALR
Wise, Ralph C.....Mansfield, O.
Wishart, Chas. A.....Jenkins Arcade Bldg., Pittsburgh, Pa., Op.

*Died.

Wolfe, C. T.....The Atherton Bldg., Louisville, Ky., OALR
Wolfe, A. C.....350 East State St., Columbus, O.
Wolfenstein, Leo. .....746 Rose Bldg., Cleveland, O.
Wood, C. A.....7 West Madison, Chicago, Ill., Op.
Wood, D.....The Donaldson Bldg., Minneapolis, Minn., OALR
Wood, Hilliard .....Independent Bldg., Nashville, Tenn., OALR
Woodruff, F. E.....Metropolitan Bldg., St. Louis, Mo., Op.
Woodruff, H. W.....Woodruff Bldg., Joliet, Ill., OALR
Woodruff, T. A.....Plant Bldg., New London, Conn., Op.
Woods, Hiram.....842 Park Ave., Baltimore, Md., Op.A
Woods, R. H.....LaSalle, Ill., OALR
Woodson, J. M.....City Natl. Bank Bldg., Temple, Tex., OALR
Woodward, J. M.....Lincoln, Neb.
Wormley, H. R.....410 Brown Bldg., Rockford, Ill.
Wright, J. B.....Raleigh, N. C.
Wright, J. W.....Central Natl. Bank Bldg., Columbus, O., Op.
Wright, J. W. M.....Hume-Mansur Bldg., Indianapolis, Ind., ALR
Wright, K. L.....247 West 8th St., Erie, Pa., ALR
Wurtz, W. J. M.....2808 Delaware Ave., Kenmore, N. Y.
Wurdermann, H. V.....Leary Bldg., Seattle, Wash., OALR
Wylie, C. B.....Morgantown, W. Va., OALR

Yankauer, S.....616 Madison Ave., New York City, N. Y., ALR
Young, H. B.....204 Jefferson St., Burlington, Ia., OALR
Young, H. H.....Morrison Bldg., Charleston, W. Va., OALR

Zehnder, C. A.....180 Fairmount Ave., Newark, N. J.
Ziegler, S. L.....1625 Walnut St., Philadelphia, Pa., Op.
Zemer, S.....Security Mutual Bldg., Lincoln, Neb., OALR

GEOGRAPHICAL LIST

ALABAMA

BIRMINGHAM

Harrison, W. G. ..... Empire Bldg., OALR
Ledbetter, S. L. ..... First National Bank Bldg., OALR
Rucker, Edmond W. J. ..... ALR

MOBILE

Maumenee, A. E. ..... 156 St. Francis St., OALR
O'Gwynn, J. C. ..... Van Ant Bldg.

MONTGOMERY

Thigpen, C. A. ..... First National Bank Bldg., OALR

SELMA

Kirkpatrick, Samuel ..... Lauerdale Ave., OALR

TUSCALOOSA

Searcy, H. B. ..... 807 Greensboro Ave., OALR

ARKANSAS

FORT SMITH

Dorento, Dred R. ..... Merchants National Bank Bldg., OALR
Moulton, Herbert ..... Merchants National Bank Bldg., OALR

HOT SPRINGS

King, O. H. ..... Dugan-Stuart Bldg., OALR
Rowland, J. F. ..... Thompson Bldg., OALR
Short, Z. N. ..... Dugan-Stuart Bldg., OALR

LITTLE ROCK

Caldwell, Robert ..... State National Bank Bldg., OALR
Vinsonhaler, Frank ..... Urquhart Bldg., OALR

PINE BLUFF

Crump, J. F. ..... Citizens' Bank Bldg., OALR
Scales, J. W. ..... 202½ Main St., OALR

CALIFORNIA

LOS ANGELES

Brown, J. Mackenzie ..... Brockman Bldg., ALR
Detling, F. ..... Investment Bldg., OALR
Dudley, Wm. H. ..... Brockman Bldg., OALR
Fleming, E. W. ..... Trust and Savings Bldg., ALR
Graham, Richard W. ..... Consolidated Realty Bldg., Op.
Kiefer, Hugo A. ..... Brockman Bldg., OALR
Kress, Geo. H. ..... Bradbury Bldg., OALR
Kyle, J. J. ..... Title Insurance Bldg., OALR
Mansur, D. W. ..... Brockman Bldg., Op.
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Dresel, Gustav ..... 209 Post St.
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Green, Louis D. ..... 210 Post St., Op.
Horn, Henry ..... 135 Stockton St., ALR
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Ravdin, Marcus ..... 223 Main St., OALR

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Tingley, Louisa P.....9 Massachusetts Ave., Op.
Tobey, G. L.....416 Marlborough St., ALR
Wells, D. W.....The Westminster, Op.
White, L. E.....390 Commonwealth Ave., ALR

CLINTON

Monahan, J. A.....181 Chestnut St., OALR

FALL RIVER

Ryder, D. R.....151 Rock St., ALR

FRAMINGHAM

Jessaman, L. W.....30 Hollis St., OALR

GARDNER

Bone, H. D.....29 Parker St., OALR

HOLYOKE

Hussey, E. J.....276 High St., OpLR

LAWRENCE

Conlon, F. A.....Bay State Bldg.
Merrill, W. H.....Bay State Bldg., OALR

LYNN

Cobb, C. M.....10 Nahant St., OALR
Jones, E. W.....44 Atlanta St., OpA
O'Reilly, W. F.....44 S. Common St., OALR

NEW BEDFORD

Potter, L. F.....278 Union St., OALR

NORTH ADAMS

Thompson, G. H.....18 Ashland St., OALR

NORTHAMPTON

Collins, J. D.....90 Main St., ALR
Dow, F. E.....Central Chambers, Op.

PALMER

Freligh, C. A.....
Moore, G. A.....Bank Bldg., OALR

SPRINGFIELD

Byrnes, H. F.....4 Chestnut St., OALR
Carleton, Ralph.....10 Temple St., Op.
Dillon, J. A.....310 Main St., ALR
Irwin, V. J.....351 Main St., OALR

TAUNTON

Baker, H. B.....59 Main St., OALR

WESTFIELD

Clark, F. T.....52 Broad St., OALR

WORCESTER

Cahill, J. W.....390 Main St.
Cross, A. E.....Slater Bldg., Op.
Estabrook, Charles.....390 Main St., OALR
O'Connor, F. O.....State Mutual Bldg.

MICHIGAN

ANN ARBOR

Slocum, George.....311 S. State St., Op.

BATTLE CREEK

Colver, B. N.....182 Manchester St., OALR
Farnesworth, M. A.....146 Greenwood St.
Haughey, Wilfrid.....24 W. Main St., OALR
Sleight, R. D.....Post Bldg., OALR
Stegman, L. B.....56 Manchester St.
Wencke, C. G.....16 Wentworth Ct.

BAY CITY

Baker, C. H.....Crapo Block, OALR

DETROIT

Amberg, Emil ..... David Whitney Bldg., ALR
Beattie, Robert ..... David Whitney Bldg., OALR
Bernstein, E. J. ..... Kresge Bldg., OALR
Campbell, D. A. ..... Peter Smith Bldg.
Campbell, Don M. ..... Peter Smith Bldg., OALR
Connor, Ray ..... 503 Washington Arcade, OALR
Gillman, R. W. ..... 33 Peterbow St., Op.
Goux, L. J. ..... David Whitney Blg., OALR
Hartz, H. J. ..... 27 E. Adams St., ALR
Hickey, P. W. ..... 32 W. Adams St, R
Maire, L E. ..... Park Bldg., Op.A
Mercer, R. E. ..... David Whitney Bldg., LR
Miner, S. G. ..... 270 Woodward Ave., ALR
Odell, Anna ..... 32 Adams St., OpAL
Parker, Walter R. ..... 32 Adams St., Op.
Renaud, G. L. ..... Fine Arts Bldg., OALR
Sanderson, H. H. ..... David Whitney Bldg., OALR
Shurley, B. R. ..... 32 W. Adams St., ALR

ESCANABA

Boyce, William ..... 1019 Ludington St., OALR

GRAND RAPIDS

Huizinga, J. G. ..... Widdicomb Bldg., OALR
Robertson, F. D. ..... Ashton Bldg., OALR
Roller, L. A. ..... 122 Monroe St., OALR
Welsh, D. E. ..... Powers Theater Bldg., OALR

IRON MOUNTAIN

Boyce, G. H. ..... OALR

KALAMAZOO

Fulkerson, C. B. ..... Kalamazoo Natl. Bank Bldg., OALR
Grant, F. E. ..... Kalamazoo Natl. Bank Bldg., OALR
Wilbur, E. P. ..... Kalamazoo Natl. Bank Bldg., OALR

SAGINAW

Rogers, A. S. ..... 105 S. Jefferson Ave., OALR

MINNESOTA

DULUTH

Collins, Homer ..... New Jersey Bldg., OALR
Conkey, C. D. ..... Fidelity Bldg.
Tilderquist, D. L. ..... 7 E. Superior St.
Turnbull, F. M. ..... Providence Bldg.

FERGUS FALLS

Kittleson, Theodore ..... OALR

GREAT FALLS

Coulter, C. F. ..... First Natl. Bank Bldg.

HIBBING

Morsman, L. W. ..... Congdon Bldg.

MANKATO

James, J. H. ..... Natl. City Bank Bldg., OALR

MINNEAPOLIS

Bishop, C. W. ..... La Salle Bldg.
Brown, E. J. ..... Syndicate Blk., OALR
Camp, W. E. ..... Donaldson Bldg.
Clark, H. S. ..... Syndicate Blk., OALR
Litchfield, J. T. ..... Phys. and Surgeons' Bldg.
Lewis, J. D. ..... La Salle Bldg.
Loomis, E. A. ..... Donaldson Bldg., OALR
Macine, J. S. ..... Donaldson Bldg.
Matthews, Justus ..... Metropolitan Bldg., LR
Morse, J. A. ..... Donaldson Bldg.
Murray, W. R. ..... Phys. and Surg. Bldg., OALR

Newhart, Horace ..... Donaldson Bldg., OALR
Oberg, C. M. ..... Syndicate Blk., OALR
Parker, E. H. ..... La Salle Bldg., LR
Patterson, W. E. ..... 808 Mary Place.
Pratt, F. J., Jr. ..... Metropolitan Bldg., OALR
Pratt, J. A. ..... Metropolitan Bldg., OALR
Reynolds, J. D. ..... La Salle Bldg.
Strout, E. S. ..... Donaldson Bldg.
Strout, G. E. ..... Donaldson Bldg.
Wood, Douglas ..... Donaldson Bldg., OALR

ROCHESTER

Benedict, W. L. .....
Fisher, Carl ..... OpA

ST. PAUL

Beaudoux, H. A. ..... Lowry Bldg., OpA
Binger, H. E. .....
Boeckman, Egil ..... Lowry Bldg., OALR
Bray, E. R. ..... 934 Ashland Ave., OALR
Burch, F. C. ..... Lowry Bldg., A
Heath, A. C. ..... Lowry Bldg., ALR
Larsen, Carl E. ..... Lowry Bldg. OALR
Nelson, L. A. ..... Lowry Arcade, OpA
Shellman, J. L. ..... Lowry Bldg., OALR

MISSISSIPPI

MERIDIAN

Guthrie, J. M. ..... Rosenbaum Bldg., OALR

UNIVERSITY

Guyton, B. S. .....

VICKSBURG

Bell, M. H. ..... First Natl. Bank Bldg., OALR
Edwards, C. J. ..... 1422 Wash, OALR
Howard, E. F. ..... First Natl. Bank Bldg.

MISSOURI

CARTHAGE

Powers, Everett ..... Central Natl. Bank Bldg., OALR

COLUMBIA

Noyes, G. L. ..... OALR

JOPLIN

Pifer, J. D. ..... Frisco Bldg., OALR

KANSAS CITY

Beil, J. W. ..... Argyle Bldg.
Blakesley, T. S. ..... Lathrop Bldg., OALR
Curdy, R. J. ..... Rialto Bldg., Op.
Foster, Hal ..... Altman Bldg., ALR
Howard, J. W. ..... Rialto Bldg., OALR
Keith, W. E. ..... Waldheim Bldg.
Kimberlin, J. W. ..... Rialto Bldg., Op.
Lansing, J. H. ..... Lathrop Bldg., ALR
Lichtenberg, J. S. ..... Rialto Bldg., Op.
Lorie, Alvin ..... Commerce Bldg., ALR
Painter, A. M. ..... Sharp Bldg.
Reyling, F. T. ..... Rialto Bldg., Op.
Roberts, S. E. ..... Waldheim Bldg., ALR
Sawtell, J. E. ..... Waldheim Bldg., ALR
Thomason, H. E. ..... Rialto Bldg., OALR

NEVADA

McLemore, Tipton ..... OALR

ST. LOUIS

Alt, Adolph ..... Metropolitan Bldg., Op.
Arbuckle, M. F. ..... Lister Bldg.
Barck, Carl ..... Humboldt Bldg., Op.A
Bardenheier, F. G. A. ..... Frisco Bldg., ALR
Black, W. D. ..... Metropolitan Bldg., OALR
Bryan, W. M. C. ..... Humboldt Bldg., ALR
Burns, S. S. ..... Humboldt Bldg., ALR
Goldstein, M. A. ..... 3858 Westminister Pl., ALR
Green, John, Jr. ..... Metropolitan Bldg., Op.
Guggenheim, L. K. ..... Carleton Bldg., ALR
Gundelach, C. A. ..... 4500 Olive St., ALR
Hardy, W. F. ..... Metropolitan Bldg., Op.
Henderson, F. L. ..... Humboldt Bldg., Op.
Higbee, E. H. ..... Metropolitan Bldg., Op.
Jacobs, M. W. ..... Carleton Bldg., Op.
Jennings, J. E. ..... Carleton Bldg., OALR
Leavy, C. A. ..... Metropolitan Bldg., ALR
Loeb, H. W. ..... Humboldt Bldg., ALR
Pfingsten, C. F. ..... 508 N. Grand Ave., ALR
Post, Martin H. ..... Metropolitan Bldg., Op.
Sauer, W. E. ..... Humboldt Bldg., ALR
Scholz, R. P. ..... Metropolitan Bldg., ALR
Shahan, W. E. ..... Metropolitan Bldg., Op.
Shoemaker, W. A. ..... Carleton Bldg., Op.
Sluder, Greenfield ..... 3542 Washington Ave., ALR
Tooker, C. W. ..... Carleton Bldg., Op.
Wiener, Meyer ..... Carleton Bldg., Op.
Woodruff, F. E. ..... Metropolitan Bldg., Op.

SPRINGFIELD

Bailey, Harold ..... Woodruff Bldg., OALR

MONTANA

BUTTE

Dayton, G. O. ..... Lewisohn Bldg., OALR
Donavan, J. A. ..... Phoenix Bldg., OALR
Morse, A. W. ..... Phoenix Bldg.
Potter, Peter ..... Hennesy Bldg., OALR

NEBRASKA

COLUMBUS

Campbell, C. H. .....

CRETE

Byrnes, M. R. ..... OALR

FAIRBURY

Curtis, Wesley L. ..... OALR

LINCOLN

Brooks, E. B. ..... Terminal Bldg.
Cook, S. E. ..... Richards Block, OALR
Dayton, W. L. ..... Funke Bldg., OALR
Furgason, A. P. ..... Richards Block, OALR
Hompes, J. J. ..... Security Mutual Bldg., OALR
Sanderson, David D. ..... Funke Bldg., OALR
Teal, F. F. ..... Richards Block, OALR
Williams, J. P. .....
Woodward, J. M. ..... Richards Block.
Zemer, S. G. ..... Security Mutual Bldg., OALR

OMAHA

Banister, Col. J. M. ..... Brandeis Theater Bldg.
Callfas, W. F. ..... Brandeis Bldg.
Gifford, Harold ..... Brandeis Bldg., OpA
Isaac, David ..... Brandeis Theater Bldg., OALR

Knovde, A. R. ..... Omaha Natl. Bank Bldg., ALR
Lemere, H. B. ..... Brandeis Bldg., OALR
Owen, F. S. ..... Brandeis Bldg., OALR
Patton, J. M. ..... Brandeis Bldg., OALR
Potts, J. B. ..... Brandeis Bldg., AL
Rubendall, Clarence ..... Brandeis Bldg., OALR
Wherry, W. P. ..... Brandeis Theater Bldg., OALR

NEW HAMPSHIRE

HANOVER

Carleton, E. H. ..... ALR

NASHUA

Nutter, C. F. ..... 16 Amherst St., Op.

PORTSMOUTH

Lance, A. J.* ..... 15 Congress St., OALR

NEW JERSEY

ASBURY PARK

Upham, Helen F. ..... 305 Third Ave., OALR

ATLANTIC CITY

Charlton, C. C. ..... 124 S. Illinois St., ALR

JERSEY CITY

Bull, E. L. ..... 100 Sip Ave., OALR
Chambers, T. R. ..... 15 Exchange Pl., OALR
Pyle, Wallace ..... 612 Berger Ave., OALR

LONG BRANCH

Campbell, W. K. ..... 96 Third Ave.

NEWARK

Beggs, W. F. ..... 2 Lombardy St., OALR
Chattin, J. F. ..... 671 Broad St.
Hürf, J. W. ..... 71 Washington St.
Orton, H. B. ..... 671 Broad St., ALR
Sherman, E. S. ..... 67 Broad St., OALR
Sutphen, T. Y. ..... 997 Broad St., Op.
Zehnder, C. A. ..... 180 Fairmount Ave.

ORANGE

Emerson, Linn ..... Metropolitan Bldg., OALR

TRENTON

Adams, Charles ..... 52 W. State St., OALR

NEW MEXICO

ALBUQUERQUE

Tull, Frank E. ..... State Natl. Bank Bldg., OALR

NEW YORK

ALBANY

Bedell, A. J. ..... 344 State St., Op.A
Dowling, J. I. ..... 116 Washington Ave., OALR

BINGHAMPTON

Watson, H. D. ..... 151 Front St., OALR

BROOKLYN

Arrowsmith, Herbert ..... 170 Clinton St., ALR
Hancock, J. C. ..... 135 Cambridge Pl., Op.
Lutz, S. H.* ..... 284 Hancock St., ALR
McClelland, L. A. ..... 78 McDonough St., ALR

BUFFALO

Andrews, Herman D. ..... 486 Franklin St., Op.
Bennett, A. G. ..... 26 Allen St.
Blaauw, E. E. ..... 327 Franklin St., OALR
Brown, C. M. ..... 510 Delaware Ave., ALR

*Died.

Cott, C. C. ..... 1001 Main St., ALR
Cott, G. F. ..... 1001 Main St., ALR
Cowper, H. W. ..... 543 Franklin St., Op.
Edson, Ray ..... 560 Delaware Ave., Op.
Flagg, J. D. ..... 473 Virginia Ave., Op.A
Forsyth, E. A. ..... 471 Virginia Ave., ALR
Francis, L. M. ..... 636 Delaware Ave., Op.
Glosser, Herbert H. ..... 448 Franklin St., OALR
Howe, Lucien ..... 520 Delaware Ave., Op.
Hubbard, A. E. ..... 372 Franklin St., Op.
Jackle, A. F. ..... 546 Delaware Ave.
Lewis, F. P. ..... 454 Franklin St., Op.
Phillips, W. L. ..... 449 Franklin St., Op.
Renner, W. S. ..... 341 Linwood Ave., ALR
Rogers, B. F. ..... 222 Franklin St., Op.A
Satterlee, R. H. ..... 187 Delaware Ave., Op.
Starr, E. G. ..... 523 Delaware Ave., Op.
Weed, Harry M. ..... 405 Delaware Ave., Op.

ELMIRA

Case, G. M. ..... 154 Main St., OALR

GENEVA

Spengler, J. A. ..... Masonic Temple, OALR

ITHACA

Kirkendall, J. S. ..... 315 N. Aurora, OALR
Wilson, R. C. ..... 208 E. State St., OALR

JAMESTOWN

Reger, H. S. ..... New Wellman Bldg., OALR

KENMORE

Wurtz, W. J. M. ..... 2808 Delaware Ave.

LOCKPORT

Ringueberg, Eugene ..... 15 Main St., Op.

MINEOLA

Buckhanan, Jas. M. .....

NEW YORK CITY

Auerbach, Julius ..... 120 W. 86th St., ALR
Ballin, M. J. ..... 108 E. 60th St., ALR
Bell, C. W. H. ..... 40 E. 41st St.
Bowles, F. J. ..... 152 W. 73rd St., OALR
Bruder, Joseph ..... 230 W. 79th St., OALR
Callan, P. A. ..... 452 Fifth Ave., Op.
Carter, W. W. ..... 69 W. 50th St., ALR
Claiborne, J. H., Jr. ..... 8 W. 40th St., Op.
Cohen, Felix ..... 31 E. 60th St., ALR
Cohen, Martin ..... 1 W. 85th St., OALR
Davis, A. E. ..... 47 E. 57th St., Op.
Davis, G. E. ..... 42 W. 77th St., OALR
Dixon, G. S. ..... 40 E. 41st St., R
Duane, Alexander ..... 139 E. 37th St., Op.
Forbes, H. H. ..... 40 E. 41st St., ALR
Freudenthal, Wolff ..... 59 E. 75th St., ALR
Fridenberg, P. H. ..... 38 W. 59th St., OALR
Friedman, David ..... 44 W. 77th St., ALR
Gatewood, W. L. ..... 15 E. 48th St., ALR
Glogau, Otto ..... 1320 Madison Ave., OALR
Gottlieb, M. J. ..... 814 West End Ave.
Grushlow, Israel ..... 271 Central Park, W., ALR
Guttman, John ..... 60 St. Marks Pl., OALR
Hans, C. L. ..... 2900 Grasselli Ave.
Haskin, W. H. ..... 40 E. 41st St., ALR
Hays, H. N. ..... 11 W. 81st St., ALR
Hopkins, W. E. ..... 515 Park Ave., OALR
Hubby, Lester M. ..... 27 W. 68th St., ALR
Hurd, L. M. ..... 39 E. 50th St., ALR

Imperatori, C. J. ..... 245 W. 102d St., ALR
Ingerman Sergius ..... Hotel Brunswick, OALR
Irwin, F. N. ..... 527 Fifth Ave., OALR
Jacobs, S. M. ..... 375 E. 149th St., OALR
Jarecky, Herman ..... 138 W. 86th St., OALR
Judd, H. B. ..... 47 E. 57th St.
Kerrison, P. D. ..... 70 E. 42d St., ALR
Key, B. W. ..... 7 W. 49th St., Op.
King, J. J. ..... 40 E. 41st St., ALR
Knapp, Arnold ..... 10 E. 54th St., Op.
Kopetzky, S. J. ..... 616 Madison Ave., ALR
Krug, E. F. ..... 12 W. 44th St., OALR
Kunz, Hogo ..... 640 Riverside Drive, ALR
LaVigine, A. A. ..... 129 W. 46th St., OALR
Lubman, Max ..... 616 Madison Ave.
Lynah, H. L. ..... 127 W. 58th St., OALR
May, C. H. ..... 698 Madison Ave., Op.
Maybaum, J. E. ..... 17 E. 38th St., ALR
Mayer, Emil ..... 40 E. 41st St., ALR
McCoy, John ..... 157 W. 73d St., ALR
Meierhof, E. L. ..... 1140 Madison Ave., OALR
Mittendorf, A. D. ..... 399 Park Ave., Op.
Mittendorf, W. F. ..... 115 E. 53d St., Op.A
Mortimer, W. G. ..... 58 Central Park, W., OALR
Nisselson, Max ..... 616 Madison Ave.
Oppenheimer, Seymour ..... 45 E. 60th St., OALR
Payne, S. M. ..... 542 Fifth Ave., OALR
Phillips, W. C. ..... 40 W. 47th St., ALR
Reese, R. G. ..... 50 W. 52nd St., Op.
Schiller, A. N. ..... 1855 Seventh Ave., ALR
Schoenberg, M. J. ..... 103 E. 31st St., Op.
Stevens, Geo. T. ..... 350 W. 88th St., Op.
Strouse, A. N. ..... 132 W. 58th St., OALR
Sturges, L. F. ..... 128 W. 87th St., LR
Thomson, J. J. ..... 40 W. 47th St., OALR
Valk, Francis* ..... 164 E. 61st St., Op.
Voorhees, Irving W. ..... 14 Central Park, W., ALR
Webster, David ..... 24 E. 48th St., Op.A
Weinstein, Joseph ..... 261 Central Park, W., ALR
Wheeler, J. M. ..... 80 W. 40th St.
Wiener, Alfred ..... 550 Park Ave., OALR
Yankauer, Sidney ..... 616 Madison Ave., ALR

NIAGARA FALLS

Price, N. W. .....

NORWICH

Smith, H. E. ..... 178 Broad St., OALR

NYACK

Toms, S. W. ..... OALR

OLIAN

Tindolph, Leah F. ..... OALR

ONEIDA

Crockett, R. L. ..... Op.

POUGHKEEPSIE

Krieger, W. A. ..... 36 Market St.

ROCHESTER

Barber, Frank ..... 259 Alexander St., Op.
Bissell, E. J. ..... 75 S. Fitzhugh St., OpA
Carroll, G. G. ..... 614 Main St., West, OALR
Clark, L. H. ..... 337 Monroe Ave., OALR
Conboy, Philip ..... 82 East Ave., OALR
McDowell, N. D. ..... 355 East Ave., OALR

*Died.

Morris, A. G. ..... 41 Gibbs St.
Shapero, I. M. ..... 18 Gibbs St.

SYRACUSE

Britten, G. S. ..... University Blk., OALR
Brust, H. O. ..... 720 S. Crouse Ave., ALR
Fowler, S. R. ..... University Bldg., ALR
Kline, H. G. ..... University Blk., ALR
Lewis, G. G. ..... University Blk., OALR

NORTH CAROLINA

ASHEVILLE

Russell, E. R. ..... Legol Bldg., OALR

CHARLOTTE

Matheson, J. P. ..... Realty Bldg., OALR
Whisnant, A. M. ..... Realty Bldg., OALR

GREENSBORO

Reaves, W. P. ..... OALR

NEW BERN

Daniels, R. L. .....

RALEIGH

Battle, K. P., Jr. ..... Citizens Bank Bldg., OALR
Wright, J. B. .....

SALISBURY

Brawley, R. V. .....

WILMINGTON

Murphy, J. Z. .....

OHIO

AKRON

Brown, L. E. ..... Metropolitan Bldg., OALR
Stevenson, D. W. ..... 165 E. Market St., OALR

ALLIANCE

King, G. L. ..... 537 E. Market St., OAR

BELFONTAINE

Harbert, J. P. .....

CANTON

Hill, A. J. ..... 3351 S. Cleveland Ave., OALR
Schild, E. H. ..... 9th and Cleveland, OpA

CINCINNATI

Allen, S. E. ..... 22 W. 7th St., ALR
Ayers, W. M. ..... The Leverone, OpA
Fitzpatrick, T. V. ..... 19 W. 7th St., ALR
Harris, W. C. ..... Groton Bldg., ALR
Heflebower, R. C. ..... The Lancaster, OALR
Hinnen, G. A. ..... 1343 Delta Ave., OALR
Holmes, C. R.* ..... 10 E. 8th St., OALR
Iglauer, Samuel ..... Livingston Bldg., ALR
Keller, W. S. ..... Croton Bldg., OLAR
King, Clarence ..... Union Central Bldg., Op.
Krieger, G. M. ..... 4800 Whitsee Ave., OALR
Lamb, F. W. ..... 24 E. 8th St., OALR
Landman, L. H. ..... 14 E. 7th St., OALR
Mithoefer, William ..... 19 W. 7th St., ALR
Murphy, J. W. ..... Union Central Life Bldg., OALR
Murphy, W. E. ..... 7th and Race Sts., OALR
Phinney, F. D. ..... 22 W. 7th St., OALR
Ray, Victor ..... Groton Bldg., OALR
Schenck, W. E. ..... 19 W. 7th St., OALR
Stanberry, Henry ..... 8 E. 8th St., Op.AR
Stevenson, Robert ..... 22 W. 7th St., ALR
Stricker, Louis ..... Groton Bldg., Op.
Tangeman, C. W. ..... 19 W. 7th St., Op.

*Died.

Tangeman, H. F. ..... Central Bldg.
Thompson, E. H. ..... 19 W. 7th St., OALR
Urner, M. H. ..... Union Central Life Bldg., OALR
Vail, D. T. ..... 24 E. 8th St., OALR

CLEVELAND

Abbott, W. J. ..... Lennox Bldg.
Bruner, W. E. ..... Guardian Bldg., Op.
Burke, T. A. ..... Rose Bldg., OALR
Carpenter, M. W. ..... Osborn Bldg.
Cogan, J. E. ..... Rose Bldg., OALR
Cutler, F. E. ..... Rose Bldg., ALR
Forsythe, S. T. ..... 1011 Euclid Ave.
Ingersoll, J. M. ..... Osborn Bldg., ALR
Kendall, M. R. ..... Osborn Bldg.
Large, S. H. ..... Rose Bldg., ALR
Lauder, S. E. ..... Osborn Bldg.
Lenker, J. N. ..... Osborn Bldg., ALR
Metz, R. B. ..... Guardian Bldg., Op.
Metzenbaum, Myron ..... Rose Bldg., ALR
Monson, S. H. ..... Ainsfield Bldg., OALR
McDonald, C. L. ..... Ainsfield Bldg.
Nelson, C. F. ..... Schofield Bldg.
Pitkin, C. E. ..... Osborn Bldg., ALR
Quittner, S. S. ..... 5512 Woodland Ave., OALR
Rust, E. G. ..... Lennox Bldg., OpA
Prendergast, D. ..... 1110 Prospect Ave.
Shackelton, W. E. ..... Osborn Bldg., Op.
Simonds, O. F. ..... Rose Bldg., Op.
Stewart, J. R. ..... 2061 E. 96th St.
Stotter, James ..... 1148 Euclid Ave., OALR
Stuart, C. C. ..... Guardian Bldg., Op.
Tripp, I. A. ..... Rose Bldg.
Tuckerman, W. C. ..... Osborn Bldg., Op.
Tuckerman, W. H. ..... Osborn Bldg., OALR
Waugh, J. M. .....
Wolfenstein, Leo. ..... Rose Bldg.

COLUMBUS

Beatty, H. G. ..... 150 E. Broad St., OALR
Brown, J. E. ..... 239 E. Town St., OALR
Hauer, A. M. ..... 246 E. State St., OALR
Means, C. S. ..... 131 E. State St., OALR
Prout, A. W. ..... 239 E. Town St., OALR
Rogers, W. K. ..... 188 E. State St., OALR
Schaeffer, G. C. ..... 112 E. Broad St., OALR
Sulzer, G. A. ..... 237 E. State St., OALR
Timberman, Andrew ..... 112 E. Broad St., OALR
Wolfe, A. C. ..... 350 E. State St.
Wright, J. W. ..... Central Natl. Bank Bldg., Op.

CUYAHOGA FALLS

Dabney, W. R. ..... OALR

DAYTON

Binkley, R. S. ..... Schwind Bldg., OALR
Bonner, Horace ..... Fidelity Med. Bldg., OALR
Dutrow, H. V. ..... Reibold Bldg., OALR
Farmer, A. C. ..... Fidelity Med. Bldg., OALR
Harris, H. B. ..... Fidelity Med. Bldg., OALR
Millette, J. W. ..... Reibold Bldg., OALR
Webster, R. M. ..... Reibold Bldg.

ELYRIA

Gill, George ..... 146 Middle Ave., OALR

GREENVILLE

Hunter, J. E. ..... OALR

IRONTON

Dunn, O. B. ..... Fourth and Railroad Sts.

LIMA

Steuber, F. G.....Main and North Sts., OALR
Stuber, Paul J.....209 W. North St., OALR
Van Note, W. B.*.....Opera House Block, OALR

LORAIN

Monosmith, O. B.....424 Broadway, OALR

MANSFIELD

Garber, J. M.....48 Park Ave., OALR
Wise, R. C.....

MARIETTA

Sauer, W. W.....St. Clair Bldg., OALR

NEWARK

Hatch, C. B.....3 W. Church St., OALR

SANDUSKY

Bliss, C. B.....411 Columbus Ave., OALR

SPRINGFIELD

Easton, J. C.....Fairbanks Bldg., OALR
Hartley, F. A.....Fairbanks Bldg., OALR
Hogue, D. W.....Fairbanks Bldg., OALR
Minor, C. L.....Fairbanks Bldg., OALR

STEUBENVILLE

Cooper, H. W.....
Gourley, G. F.....Sinclair Bldg.

TIFFIN

Porter, E. H.....85 Madison St., OALR

TOLEDO

Alderdyce, W. W.....Nasby Block, OALR
Alter, F. W.....Colton Bldg., OALR
Hobart, Bertha K.....Produce Exchange Bldg., Op.
Jacobi, Frank.....Colton Bldg., OALR
Keller, T. F.....The Spitzer, OALR
Lukens, Charles.....218 Michigan Ave., OALR
Snyder, W. H.....211 Ontario St. OALR

VAN WERT

Bartholomew, A. C.....OALR

WARREN

Marshall, J. P.....Stone Bldg., OALR
Smith, F. K.....121 Mahoning Ave., OALR

XENIA

Madden, Reed.....Allen Bldg., OALR

YOUNGSTOWN

Gibson, R. D.....Dollar Saving and Trust Bldg., OALR
Hartzell, S. M.....Dollar Bank Bldg., OALR

ZANESVILLE

Baron, F. S.....Peoples Bank Bldg., OALR
Culbertson, L. R.....Masonic Temple, OALR

OKLAHOMA

BARTLESVILLE

Kiser, J. D.....

ENID

Barnes, J. H.*.....Enid Natl. Bank Bldg., OALR

MC ALISTER

Davis, J. E.....Kress Bldg., OALR

MUSKOGEE

Fullenwider, C. M.....Barnes Bldg., OALR

OKLAHOMA CITY

Dixon, W. E.....State Bank Bldg., OALR
Ferguson, E. I.....State Natl. Bank Bldg., OALR
Guthrie, A. L.....Indian Bldg., OALR
McHenry, D. D.....Colcord Bldg., OALR

*Died.

OREGON

PORTLAND

Bruére, G. E. ..... Journal Bldg., OALR
Johnston, Wilson ..... Stevens Bldg., OALR
Kistner, F. B. ..... Stevens Bldg., ALR
McCool, Joseph L. ..... Stevens Bldg., Op.

PENNSYLVANIA

ALTOONA

Glover, S. P. ..... 1118, 12th Ave., OALR

BEAVER

Scroggs, J. J. ..... 218 E. 3d St.

BRIGHTON

Norton, Roy R. ..... Masonic Bldg., OALR

BUTLER

Doane, L. L. ..... I. O. O. F. Temple, OALR
Hazlett, L. R. ..... 117 S. Main St., OALR

CHESTER

Cross, G. H. ..... 525 Welsh St.

ERIE

Dennis, D. N. ..... 221 W. 9th St., OpA
Dunn, I. J. ..... Masonic Temple, OALR
Heard, C. F. ..... Masonic Temple, ALR
Jackson, J. D. ..... 2324 W. 8th St.
Schlindwein, G. W. ..... 138 W. 9th St., OALR
Shreve, O. M. ..... 162 W. 8th St., OALR
Wright, Katherine L. ..... 247 W. 8th St., ALR

FRANKLIN

Jobson, G. B. ..... OALR

GREENSBURG

McKee, C. W. ..... OALR

HARRISBURG

Farnsler, H. H. ..... 1438 Market St.
Park, J. W. ..... 32 N. 2d St., OALR
Rebuck, C. S. ..... 412 N. 3d St., OALR

HAZELTON

Reiche, O. C. ..... 328 W. Broad St., OALR

HUNTINGTON

Sears, W. H. ..... 514 Penn St., OALR

JOHNSTOWN

Barker, O. G. A. ..... Johnstown Trust Bldg., Op.
Harris, Clarence M. ..... Johnstown Trust Bldg., OALR

MIDDLETOWN

George, H. W. ..... 254 Spring St., Op.

NEW KENSINGTON

Steim, Joseph M. ..... Op.

NORRISTOWN

Pyfer, Howard* ..... 131 W. Main St., OALR

PHILADELPHIA

Appleman, L. F. ..... 308 S. 16th St., Op.
Baldwin, Kate W. ..... 1117 Spruce St., ALR
Boehringer, H. W. ..... 1811 S. 22nd St., Op.
Brown, S. H. ..... 1901 Mt. Vernon St., Op.
Butt, M. M. ..... 1701 Chestnut St., Op.
Crampton, G. S. ..... 1700 Walnut St., Op.
Creighton, W. J. ..... 1905 Chestnut St., Op.
Croskey, J. W. ..... 1909 Chestnut St., OALR
Davis, J. L. ..... 135 S. 18th St., ALR
Felt, C. L. ..... 2007 Chestnut St., ALR
Fox, L. W. ..... 1636 Spruce St., Op.
Gleason, E. B. ..... 2033 Chestnut St., ALR

*Died.

Goddard, H. M. ..... 1338 Spruce St., ALR
Heed, C. R. ..... 1402 Spruce St., Op.
Holloway, T. B. ..... 1819 Chestnut St., Op.
Jackson, Chevalier ..... 17th and Walnut Sts., L
Kaufman, A. S. ..... 254 S. 16th St., ALR
Keeler, J. C. ..... 254 S. 16th St., ALR
Krauss, Frederick ..... 1701 Chestnut St., OALR
Lawrence, Granville A. ..... Medical Arts Bldg., Op.
Love, Louis F. ..... 1305 Locust St., Op.
Macfarlin, Douglas ..... 1805 Chestnut St., OALR
Miller, E. B. ..... 2028 Chestnut St.
Mitchell, E. K. ..... 704 Lehigh Ave., OLR
O'Reilly, C. A. ..... 1806 Chestnut St., ALR
Peter, L. C. ..... 1527 Spruce St., Op.
Pontius, P. J. ..... 1831 Chestnut St., OALR
Ridpath, R. F. ..... 1928 Chestnut St., ALR
Risley, S. D. ..... 2018 Chestnut St., Op.
Scarlett, Hunter W. ..... 2228 Locust St.
Schneideman, T. P. ..... Professional Bldg., Op.
Schweinitz, G. E. de ..... 1705 Walnut St., Op.
Schwenk, P. N. K. ..... 1417 N. Broad St., Op.
Shannon, C. E. ..... 1633 Spruce St., Op.
Skillern, R. H. ..... 2032 Chestnut St., LR
Smith, S. McC. ..... 1429 Spruce St., ALR
Spencer, W. H. ..... 1830 S. Rittenhouse Sq., OALR
Stiles, C. M. ..... 1831 Chestnut St., Op.
Stout, G. C. ..... 1611 Walnut St., AL
Sweet, W. M. ..... 1205 Spruce St., Op.
Zeigler, S. L. ..... 1625 Walnut St., Op.

PITTSBURGH

Beane, G. W. ..... Jenkins Arcade Bldg., OALR
Bernatz, C. F. ..... Park Bldg., Op.
Blair, W. W. ..... Diamond Bank Bldg., Op.
Brown, W. E. ..... Union Arcade Bldg., OALR
Carson, W. E. ..... Jenkins Arcade Bldg.
Craighead ..... Jenkins Arcade Bldg.
Curry, G. E. ..... Westinghouse Bldg., Op.
Day, E. W. ..... Westinghouse Bldg., ALR
Dickinson, B. M. ..... Union Arcade Bldg., ALR
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Krebs, A. ..... Jenkins Arcade Bldg., Op.
Linn, J. G. ..... Highland Bldg.
McLachlan, A. A. ..... Empire Bldg., ALR
Markel, J. C. ..... Westinghouse Bldg., Op.
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Meanor, W. C. ..... Keenan Bldg.
McCready, J. H. ..... Empire Bldg., ALR
Murdoch, J. F. ..... Bessemer Bldg., Op.
Patterson, E. J. ..... Westinghouse Bldg.
Seegman, Simon ..... Jenkins Arcade Bldg., ALR
Shuman, G. H. ..... East End Trust Co., Op.
Smith, S. S. ..... Jenkins Arcade Bldg., Op.
Stieren, Edward ..... Union Arcade Bldg., Op.
Stinson, Geo. W. ..... Jenkins Arcade Bldg.
Sturm, S. A. ..... Jenkins Arcade Bldg., Op.
Taylor, Martin C. ..... 415 Warrington Ave.
Turner, Hunter H. ..... Jenkins Arcade Bldg., Op.
Van Kirk, V. E. ..... Union Arcade Bldg., Op.
Weimer, Edgar S. ..... 332 Lehigh Ave., Op.
Weisser, E. A. ..... Empire Bldg., Op.
Wible, E. E. ..... Diamond Bank Bldg., Op.

Willetts, J. E. ..... Jenkins Arcade Bldg.
Wishart, C. A. ..... Jenkins Arcade Bldg., Op.

READING

Stockler, J. A. ..... 249 N. 5th St., OALR

RIDGEWAY

McAlister, J. C. ..... OALR

SCRANTON

Corser, J. B. ..... Scranton Private Hospital, OALR
Frey, C. L. ..... 529 Vine St., OALR

SUNBURY

Becker, H. M. ..... 49 S. 4th St., OALR

WARREN

Ball, M. V. ..... 310 Third Ave., OALR

WASHINGTON

McKennan, J. W. ..... Washington Trust Bldg.
McMurray, J. B. ..... Washington Trust Bldg., OALR

WILKES-BARRE

Buckman, E. V. ..... 70 S. Franklin St., OALR
Carr, G. W. ..... 30 S. Franklin St., OALR
Kistler, O. F. ..... 43 N. Franklin St., Op.AR
Schaffert, N. L. ..... 57 S. Washington St., OALR
Taylor, L. H. ..... 83 S. Franklin St., OALR

YORK

Klinedienst, J. F. ..... 220 S. George St., OALR

RHODE ISLAND

NEWPORT

Jacoby, D. P. A. ..... 106 Touro, OpAL

PROVIDENCE

Bigelow, F. N. ..... 265 Benefit St., ALR
Capron, F. P. ..... 118 Angell St., OALR
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Leech, J. W. ..... 111 Broad St., OALR
Messinger, H. C. ..... 170 Broad St., Op.
Muncy, W. M. ..... 25 Waterman St., OALR
Porter, L. B. ..... 117 Waterman St., OALR

SOUTH CAROLINA

CHARLESTON

Kollock, C. W. ..... 86 Wentworth, OALR

COLUMBIA

Whaley, E. M. ..... 1430 Blanding St., OALR

GREENVILLE

Mauldin, L. O. ..... Wallace Bldg., OALR

ROCKHILL

Twitty, W. E. .....

SOUTH DAKOTA

HURON

Grosvenor, L. N. ..... 378 Dakota St., OALR

MITCHELL

Bobb, E. V. ..... OALR

SIOUX FALLS

Parsons, J. G. ..... Paulton Bldg., OALR
Putnam, F. I. ..... Royce-Greeley Bldg., OALR

WATERTOWN

Johnson, A. E. ..... OALR

YANKTON

Hohf, Julius ..... Clinic Bldg., OALR

TENNESSEE

CHATTANOOGA

Hackney, F. J. ..... Hamilton Bank Bldg., OALR
Hogshead, J. M. ..... 602 Georgia Ave., OALR

CLARKSVILLE

Vaughn, G. E. ..... OALR

DYERSBURG

Dulaney, O. .....

JACKSON

Dancy, A. B. ..... First National Bank Bldg., OALR

JOHNSON CITY

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KNOXVILLE

Davis, C. H. ..... 513 Walnut St., OALR
Kincaid, J. H. ..... Ross Flats, OALR

MEMPHIS

Blue, J. B. ..... Exchange Bldg., OALR
Ellett, E. C. ..... Exchange Bldg., Op.
Fagin, Robert ..... Exchange Bldg., Op.
Farrington, P. M. ..... 40 S. Idlewild St., ALR
Levy, Louis ..... Bank of Commerce Bldg., OALR
Lewis, A. C. ..... Exchange Bldg., OALR
Michie, W. T. ..... Central Bank Bldg., OALR
Minor, H. F. ..... Randolph Bldg., OALR
Moore, F. B. ..... Exchange Bldg., OALR
Savage, G. H. ..... Central Bank Bldg., OALR
Shea, J. J. ..... Exchange Bldg., OALR
Simpson, W. L. ..... Exchange Bldg., OALR
Stanford, J. B. ..... Exchange Bldg., OALR

NASHVILLE

Cayce, E. B. ..... Hitchcock Bldg., OALR
Cullom, M. M. ..... Hitchcock Bldg., OALR
Savage, G. C. ..... 137, 8th Ave., N., Op.
Wood, Hilliard ..... Independent Bldg., OALR

TEXAS

BROWNWOOD

Anderson, W. B. ..... OALR

DALLAS

Bettison, D. L. ..... Southwestern Life Bldg., OALR
Cary, E. H. ..... Southwestern Life Bldg., OALR
Decherd, H. B. ..... Wilson Bldg., OALR
McReynolds, J. O. ..... Trust Bldg., OALR
Seay, D. E. ..... Trust Bldg., OALR

EL PASO

Carpenter, E. R. ..... Stanton and Wyoming Sts., OALR

FORT WORTH

Joyes, Crittenden.... Farmers and Mechanic National Bank Bldg., OALR

HOUSTON

Ellis, J. C. ..... Kress Bldg., OALR
Foster, J. H. ..... Kress Bldg., ALR
Haden, H. C. ..... Union National Bank Bldg.,
Israel, N. E. ..... Carter Bldg.,
Israel, Sidney ..... Carter Bldg., OALR
Ralston, W. W. ..... Kress Bldg., Op.

SAN ANTONIO

Atkinson, D. T. ..... State Bank Bldg.,
Burleson, J. H. ..... Hicks Bldg., OALR
Gwinn, G. E. ..... Hicks Bldg., OALR
Moss, R. E. ..... Hicks Bldg., OALR
Warfield, Clarence ..... Hicks Bldg., OALR

TEMPLE

McReynolds, G. S. ..... State Bank Bldg., OALR
Woodson, J. M. ..... City National Bank Bldg., OALR

TEXARKANA

Fuller, T. E. ..... State National Bank Bldg.,
Mann, R. H. T. ..... State National Bank Bldg., OALR

TYLER

Vaughn, E. H. .....

WACO

Aynsworth, Horace ..... Peerless Bldg., OALR
Scott, B. L. ..... Provident Bldg., OALR

UTAH

OGDEN

Hetzel, C. C. ..... Eccles Bldg., OALR

PROVO

Merrill, H. G. ..... 230 W. 4th St.

SALT LAKE CITY

Donoher, W. D. ..... Boston Bldg., OALR
Hampton, R. H. ..... Boston Bldg., OALR
Irvine, Alex R. ..... Kearns Bldg.,
Lindsay, D. M. ..... Boston Bldg., OALR
Snow, Leslie W. ..... Deseret Bank Bldg., OALR
Stauffer, Frederick ..... Templeton Bldg., OALR

VERMONT

BURLINGTON

Arnold, F. J. ..... 182 Pearl St., OALR
Brown, E. T. ..... 30 Church St., OALR

VIRGINIA

RICHMOND

Miller, C. M. ..... 3 W. Grace St., OALR

ROANOKE

Garrett, J. R. ..... Strickland Bldg., OALR
Gill, E. G. ..... McBain Bldg.,
Sloan, H. L. ..... McBain Bldg.,

WINCHESTER

McGuire, H. H. ..... 227 W. Water St., OALR

WASHINGTON

SEATTLE

Dowling, J. T. ..... Cobb Bldg., OALR
Hawley, Alanson W. ..... Leary Bldg., OALR
Stillson, Hamilton ..... No. Bank Bldg., OALR
Würdermann, H. V. ..... Leary Bldg., OALR

SPOKANE

Frost, W. S. ..... Paulsen Bldg., OALR
Rott, O. M. ..... Paulsen Bldg., OALR
Veasey, C. A. ..... Paulsen Bldg., OALR

WEST VIRGINIA

CHARLESTON

Covington, L. C. ..... 217½ Capitol Ave.
Haley, P. A. ..... Morrison Bldg., OALR
Young, H. H. ..... Morrison Bldg., OALR

CLARKSBURG

Louchery, D. C. ..... 212 W. Main St., OALR

FAIRMONT

Johnson, H. R. ..... 512 Walnut Ave., OALR

HUNTINGTON

Moore, T. W. ..... First National Bank Bldg., OALR

MORGANTOWN

Wylie, Charles B. ..... OALR

PRINCETON

Sedgwick, O. W. .....

WHEELING

Fawcett, Ivan .....Schmulbach Bldg., OALR

WISCONSIN

APPLETON

Brooks, E. H. .....808 College Ave., OALR
Rector, A. E. .....789 College Ave., OALR

BELOIT

Andrews, M. P. .....335½ E. Grand Ave., OALR
Nye, F. T. .....410 E. Grand Ave., OALR

CHIPPEWA FALLS

Wilkowske, C. W. .....Union Blk.

EAU CLAIRE

Payne, A. L. .....Opera House Bldg., OALR

GREEN BAY

Bellin, Joseph .....322 N. Washington St., OALR
Nadeau, E. G. .....Bellin-Buchanan Bldg., OALR

JANESVILLE

Lintleman, F. R. .....Hayes Block, OALR

KENOSHA

Ashley, T. W. ..... OALR

LA CROSSE

Bradfield, J. A. L. .....State Bank Bldg., OALR
Edwards, W. A. .....329 Main St., OALR
Smith, D. S. .....

MADISON

Dwight, C. G. .....Pioneer Bldg., OALR

MARINETTE

May, J. V. .....First National Bank Bldg., OALR

MILWAUKEE

Beebe, C. S. .....Wells Bldg., OALR
Black, N. M. .....Wells Bldg., Op.
Chapman, V. C. .....Wells Bldg., OALR
Gordon, J. S. .....Goldsmith Bldg., Op.
Grove, W. E. .....Wells Bldg., OALR
Heeb, H. J. .....Loan and Trust Bldg., OALR
Higgins, S. G. .....Wells Bldg., OALR
Hitz, H. B. .....Goldsmith Bldg., ALR
Hogue, G. I. .....410 Jefferson St., OALR
Kreutzer, A. G. .....Trust National Bank Bldg., ALR
Pfister, Franz .....Majestic Bldg., ALR
Rice, R. H. .....Coshell Bldg., OpAL

OSHKOSH

Allen, L. P. .....145 Main St., OALR

SUPERIOR

Hovde, A. G. .....Board of Trade Bldg., OALR
Shastid, T. H. .....1920 Johns Ave., OALR
Smith, R. C. .....Board of Trade Bldg., OALR

WAUSAU

Williard, L. M. .....
Schlegel, Herman T. .....501 Third St.,

WYOMING

CHEYENNE

Decker, J. C. .....First National Bank Bldg., OALR
Strader, G. L. .....First National Bank Bldg., OALR

AFRICA

JOHANNESBURG

Johnston, Lindsay .....5-6 Castle Mansion, Eloff St.

BOHEMIA

PRAGUE

Elschnig, Anton ..... Ferdinandstrasse, 10

BRAZIL

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CURITABA

Szymanski, Julius ..... OALR

CANADA

ALBERTA

EDMONTON

Brown, W. H. ..... British N. A. Bank Bldg., OALR

BRITISH COLUMBIA

VANCOUVER

Boucher, R. B. ..... Banks Bldg.,

MANITOBA

BRANDON

McDiarmid, H. O. ..... Rosser Ave. and 9th St., OALR

WINNIPEG

Watson, H. J. ..... 222 Portage Ave., ALR

ONTARIO

GUELPH

Bennetto, F. R. ..... 172 Woolwich St., OALR

HAMILTON

Macfarlane, P. B. ..... 152 James St., S., OALR

TORONTO

Boyd, Geoffrey ..... 167 Bloor St., ALR
Davis, T. A. ..... 578 Sherbourne St., OALR
Goldsmith, Perry G. ..... 84 Carlton St.,
Hill, C. E. ..... 160 Bloor St., W.,
McCulloch, R. J. P. ..... 102 College St.,
McKelvey, A. D. M. ..... 160 Bloor St., ALR

WOODSTOCK

Brodie, G. M. ..... OALR

QUEBEC

MONTREAL

Bukett, H. S. ..... 252 Mountain St., ALR
McKee, Hanford ..... 158 Crescent St., Op.A
Rogers, J. T. ..... 464 Union Ave., ALR
Rosenbaum, J. ..... 36 Sherbrook St., W.,
White, E. H. ..... 589 Dorchester St., ALR

CUBA

HAVANA

Fernandez, Francisco M. ..... Prado, 105, OALR
Fernandez, Juan Santos ..... Prado, 105

ENGLAND

LONDON

Elliot, Lt. Col. R. H. ..... 54 Welbeck St., Cavendish Sq., W.
Grant, Dundas ..... 18 Cavendish Sq., W.
Lawford, J. B. ..... 99 Harley St., Cavendish Sq., W.
Stephenson, Sydney ..... 24 Thayer St., Manchester Sq.

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GLASGOW

Gray, A. A. .....

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